Specialized Oil Publications of
THE GULF PUBLISHING COMPANY
Box 2608, Houston (1), Texas

The OIL WEEKLY and The COMPOSITE CATALOG for the drilling-producing-pipe line industry

PETROLEUM REFINER and The REFINERY CATALOG for the refining-natural gasoline industry

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Published every Monday. Single copies 25 cents (except special issues). Subscription price: domestic and foreign. $2 a year; 2 years, $3; 3 years, $4. Advertising rates on application.
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The **OIL WEEKLY**

ABC ENGINEERING NEWS STATISTICS

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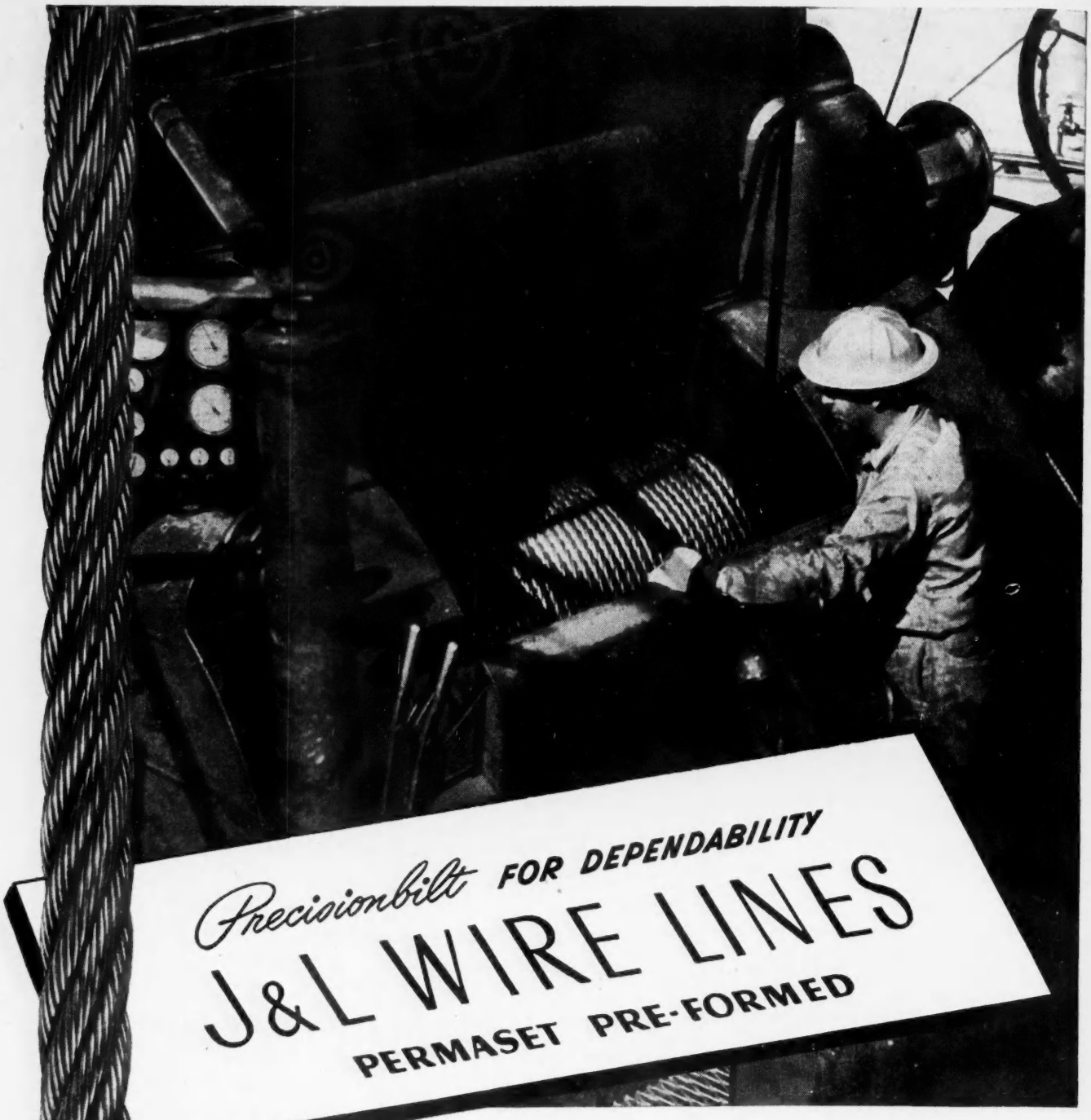

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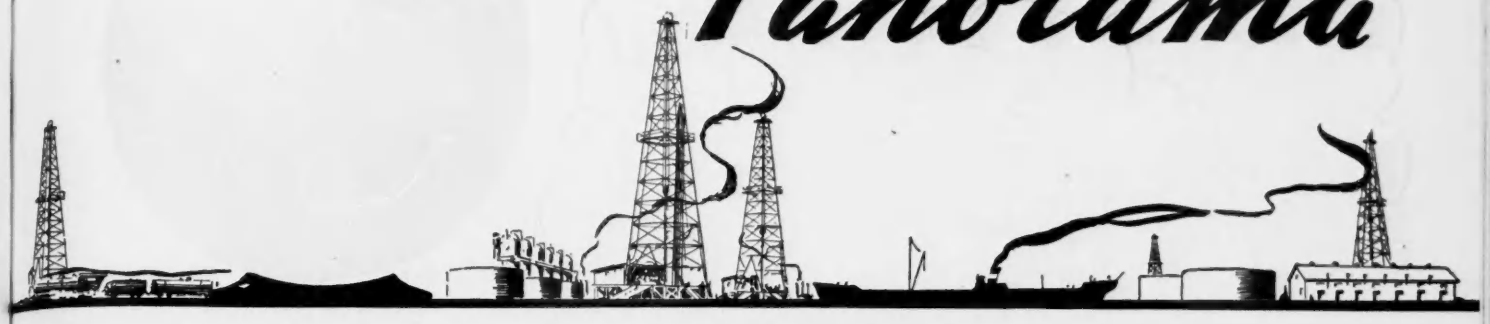

Interest In Strippers

A CAMPAIGN sponsored by the Interstate Oil Compact Commission as well as by engineers and others interested in conservation of the nation's oil resources is bearing fruit in Oklahoma where requests for permits to waterflood are on the increase.

The importance of waterflooding as well as of other methods of capturing oil through secondary recovery methods is realized today more than ever before. The industry knows that unless such methods are encouraged millions of barrels of oil will be forever lost. It is axiomatic of the oil business that once an oil field has been abandoned it is economically impossible to redrill the area.

Considerable credit for success achieved in secondary recovery in recent years is due the Pennsylvania Grade Crude Oil Association at Bradford, as well as to the Pennsylvania State College which have contributed so much important and practical data.

Producers in the East as well as marginal operators in Oklahoma, Kansas and North Texas who meet regularly to discuss techniques and problems in secondary recovery, deserve a pat on the back from the industry. They, too, are doing a big job in conservation.

One nowadays hears less about a "stripper subsidy" and more about better methods to produce marginal oil. Government paternalism which crept into the oil industry during the war and threatened to weaken the industry's traditional individualism, is disappearing, and the oil operator is once more relying on his own resources and ingenuity. He likes it better that way.

* * *

If the rate of discoveries of new oil sources in the U. S. fails to increase, we may have to draw abnormally large supplies from inventories to get through next winter. The only way to obtain more crude oil in this country is to make it profitable for someone to dig for it.

A. J. McINTOSH, Economist,
Socony-Vacuum Oil Company.

If the oil industry is to have sound public relations—if it is to have the respect of those whose conduct can affect it—it must first establish and develop its own self respect, and it must reach a high level of understanding of its own relation to its environment if it is to be able to create a corresponding level of public understanding.

W. C. WHALEY, President,
California Oil Producers Agency.

* * *

Working Both Sides Of Industry Street

ONE branch of the government (a) cries about research being strictly for benefit of industry while another branch (b) calls upon industry to undertake research for benefit of the military forces.

a) A House committee reduces by 40 percent appropriations which would enable the Bureau of Mines to conduct technical studies of primary and secondary recovery of oil, petroleum chemistry and refining and petroleum thermodynamic, giving as its reason that industry should conduct its own research because it's the one that stands to benefit.

b) The War Department, by announcement from the General Staff, outlines a broad study relating to fuels and lubricants, which problems it will "leave to industry to solve, with a minimum of detailed directions and a maximum of freedom to develop its own techniques," to quote a Washington dispatch. Every angle of military equipment will be studied and "most of the work must be done by civilian laboratories and by industry," the announcement explains.

It appears to be a case of the right hand not knowing what the left is trying to do. Which under a Washington dateline, one might say, isn't so strange.

* * *

Regardless of all the arguments that are being advanced in Congress (regarding labor legislation) and of those that will be put forth when the President acts, the most potent consideration throughout has been the possible effect on the 1948 election.

—Business Press News Bureau.

Increased Cost Seen

FOR the next several years at least, the petroleum industry should have no problem of over-capacity in refining; the problem will be rather one of having enough refining capacity. This view was expressed by Sidney A. Swensrud, executive vice president of Standard Oil Company (Ohio) in addressing the Western Petroleum Refiners' Association recently at San Antonio.

Meanwhile, he declared, there must be a realization by the industry in general as well as by refiners, that present increased costs of all kinds will require new concepts of refining costs and necessary profit margins. The return on refining facilities will have to be sufficient to allow for replacement at relatively high costs. The costs of new, modern plants, capable of turning out the high quality products henceforth to be demanded, will be relatively high not only because of high costs of materials and labor but also because of increased complexity and refinement of plant equipment. The higher capital investment per barrel of refining capacity in the new plants will mean larger annual depreciation charge and larger interest charges on capital employed, while operating expenses will include per hour labor costs 50 percent above prewar, not to mention higher costs of other kinds such as sales expenses, taxes, and management.

While the producing division of the industry has widely publicized its increased costs, said Swensrud, the refining division has the same problem and will have to obtain adequate margins in compensation.

* * *

In all history there has not been any important society in which there was freedom of worship and freedom of speech but not economic freedom. Whether economic liberty grows out of political liberty or the other way round seems beside the point. What is important is that they always exist together.

—R. T. HASLAM, Vice President,
Standard Oil Company (New Jersey.)

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THE WEEK'S NEWS

OGD DIRECTOR Max Ball and NPC Chairman Walter Hallanan made final pleas before a Senate Appropriations subcommittee for restoration of funds refused by the House for continuation of activities after June 30, warning that present oil problems of the government are as serious as those encountered during the war and need continued government-industry cooperation for their solution. Story below.

Co-Op Tax Exemption—The House Ways and Means Committee will go into cooperatives' tax exemptions next week as part of an exhaustive study of the whole tax structure, as a basis for over-all revision of the revenue laws next year. Page 32.

Helicopters Lay Pipe Lines?—The War Department General Staff has outlined an intensive program of investigation in the fields of fuels and lubricants, to be carried out during the coming fiscal year by the research and development divisions with the assistance of industry and civilian laboratories, a feature of which will be a study of the possibilites of laying pipe lines by air. Page 32.

Truman Favors Compact—A two-year extension of the Interstate Oil Compact is favored by President Truman. Originally adopted in 1937, the compact requires periodic Congressional ratification to keep it alive.

Saudi Arabia Investigation—Disclosure that State Department files dealing with Arabian oil had been turned over to the Justice Department for study and an estimate that Ibn Saud and his successors stand to get some $5 billion in royalties over the next 52 years kept the Senate investigation of Arabian American Oil Company sales to the Navy alive while the committee studies its next step to obtain documents relating to the matter from President Roosevelt's files. Page 32.

Judd Heads PESA—At their annual meeting in San Francisco, the Petroleum Equipment Suppliers Association named Ardon B. Judd of Houston president. Page 34.

Petroleum Electrical Meets—PIEA and PESA held their annual meeting in Houston last week, named officers and picked Dallas for next year's convention. Page 33.

West Texas Crude Movement—Within the next 30 days the movement of crude oil from West Texas is expected to exceed the wartime peak movement. Page 37.

FPC Membership Change—Because of ill health, Vice Chairman Richard Sachse of California has resigned from the Federal Power Commission, to be succeeded by Burton N. Behling, of Washington, D. C., director of the natural gas investigating division. The term ends 1952.

Ball and Hallanan Fight for OGD Before Senate Appropriations Group

The federal government today needs the Oil and Gas Division as much as it needed the Petroleum Administration during the war, Max W. Ball, director of OGD, told members of a Senate appropriations subcommittee last week in a final plea for funds for operation after June 30. Ball emphasized that government agencies are finding peacetime oil problems equally as acute as those encountered during the war.

He explained that the National Petroleum Council is to the OGD what PIWC was to PAW, citing instances in which it already has helped the government to deal with oil problems.

The OGD itself, he pointed out, brought to the Treasury more than $1 million in revenue through its arrangement last year for use of the Big Inch pipe lines for natural gas transportation. Also, he said, OGD initiated studies that led to sale of the lines for gas rather than oil, with an increase of $60 million in the accepted bid.

Aid Given Military

Currently, Ball said, the Army and Navy are looking to OGD for aid in obtaining oil supplies, the Treasury has asked for help in obtaining products critically needed for veterans' hospitals and other institutions and services, and the Post Office Department and other agencies have brought in similar problems.

Meanwhile OGD currently must serve in a consultative capacity to more than a score of executive departments and independent agencies concerned with various aspects of petroleum, he said.

"No useful purpose would be served by setting up a new agency to deal exclusively with petroleum, even though there may be some overlapping and duplication of work," Ball declared. "Instead, the division works with these agencies, making recommendations and assisting them with technical advice and informed viewpoint to assure unified executive petroleum policies and decisions consistent with those policies.

"Without the OGD to serve as a focal point, these activities would cease, the Armed services would find it difficult to obtain information necessary in making strategic plans for national defense, departments unable to get adequate product supplies would have no way to carry their problem to the industry as a whole, and a vitally needed link between the government and the oil industry would be severed at a time when supply and demand is in precarious balance."

Hallanan's Views

Walter S. Hallanan, chairman of the National Petroleum Council, told the subcommittee that continuance of OGD "is not a life-or-death matter to the petroleum industry but it is one of vital concern to the national security."

"It would be a serious blunder in this time of critical shortages in petroleum products for Congress to repudiate any honest effort being put forth by the government to deal realistically with a situation that could result most seriously," Hallanan said. "It will not do to await the onset of another emergency to plan the oil production necessary to meet it."

Not Like Coal

The NPC chairman denied the charge of the House Appropriations Committee that OGD was set up to provide the industry with information it could not gather itself under the anti-trust laws, and pointed out it was created at the suggestion of the House Interstate and Foreign Commerce Committee to provide government-industry cooperation.

He also challenged the appropriations committee recommendation that the division be supported by a tax on the industry, along the line of the tax on the coal industry to support the National Coal Commission. The coal industry was taxed to finance a regulatory body, while OGD has no regulatory functions. Further, he said, that was the only tax on coal, whereas petroleum is subject already to various taxes, federal and state.

Called "Public Necessity"

"The OGD is a creature and servant of government created as a public necessity," he declared. "There is no more reason why the industry should be called upon to assume the full cost of this agency of government than it should be asked to contribute the full cost of any other agency which is judged to be a public necessity."

World's Deepest At 17,327 Feet

Following the world's deepest fishing job Superior Oil Company of California's Weller 51-11, NW NW NE 11-8n-12w wildcat, five miles north of Fort Cobb in Caddo County, Oklahoma, is now drilling ahead below 17,327 feet after making 91 feet of hole in three days. (Further details on page 75.)

Drilling was resumed at 17,326 feet on May 5.

Co-Op Taxation Included In Congressional Hearing

The House Ways and Means Committee is expected next week to begin a review of tax problems, including the question of tax advantages enjoyed by cooperatives, as a preliminary to overall revision of the tax laws next year.

Both the Internal Revenue Bureau and the Joint Congressional Committee on Internal Revenue Taxation have made studies of the cooperative tax exemptions and are ready with reports. One or both may suggest that Congress follow the example of Canada, which recently made cooperatives subject to corporation-rate taxes on undistributed profits.

Much correspondence regarding cooperative taxes has resulted from announced plans for the proposed world petroleum cooperative as outlined by Howard A. Cowden, president of the Consumers Cooperative Association, the largest petroleum co-op.

Huge Lignite Possibilities Seen in Dakotas-Montana

The 90 billion barrels of synthetic liquid fuel estimated to be recoverable from U. S. oil-shale reserves is only a fraction of the possible production from the lignite field of the Dakotas and Montana, according to Interior Department experts.

From that field, according to the department, 530 billion barrels of gasoline could be produced, on the basis of 70 percent recovery and present processes of conversion.

To carry out the coal synthesis program it will be necessary for Congress to double the $30 million originally provided and extend the time for the work, now due to be completed in April, 1949.

Reports on Synthol

Gasoline from natural gas on a commercial scale will be a reality in 1949, J. H. Forrester, manager of manufacturing for Stanolind Oil and Gas Company, told a meeting of Standard Oil Company (Indiana) and affiliated companies scientists at French Lick, Ind., last week. He reported that detailed engineering of Stanolind's synthol plant in the natural gas fields of Kansas, is nearing completion.

"The new plant will produce 5300 barrels of gasoline daily and in addition byproducts each day will include 800 barrels of fuel oils, 1060 barrels of light hydrocarbons, and a half-million pounds of chemicals."

Texaco Old Timers Elect

E. E. Dattner of the sales department of The Texas Company was elected president of the Texaco Oldtimers Club at the annual meeting in Houston last week. He succeeds R. B. McLaughlin, president, Texas Pipe Line Company. Other officers elected were F. T. Baldwin, E. M. Ryan and L. A. Scholl, Jr., vice presidents; Mrs. John Turner Moore, secretary, and Ben W. Smith, treasurer.

War Department Asks Industry for Aid In Solving Various Military Problems

Petroleum pipe lines laid by helicopters or other aircraft may prove to be the answer to the oil industry's problem of carrying oil across otherwise inaccessible regions. Whether such a method is feasible may be ascertained within a year by the War Department which is making a broad study of fuels and lubricants as mapped out by the research and development division.

The study of oil problems is only one of many covering every angle of military equipment. Most of the work in carrying out the program must be done by civilian laboratories and by industry, the General Staff said in announcing details.

In handling questions, the department will outline the problem and leave it to industry to solve, with a minimum of detailed direction and a maximum of freedom to develop its own techniques, it was explained.

Among projects enumerated for study are the following in the field of petroleum:

Petroleum distribution equipment: Future research and development will be directed toward a continued increase in the efficiency of distribution systems. Gas turbine and steam turbine prime movers will be investigated for use on high speed centrifugal pumps. Lightweight materials will be used to a greater extent. Feasibility of using track-laying reel trucks to lay collapsible pipe line will be investigated. Helicopters or other aircraft may be used to a large extent in laying pipe lines in otherwise inaccessible areas. Greatly increased fuel requirements of new aircraft have necessitated revisions of airfield refueling systems.

Transportation: Development of a liquid cargo vessel, designed with increased speed and power over existing designs, has become necessary. Rail-power-marine applications of the light-weight diesel engine will be undertaken, and the basic design expanded into a family of engines with a wide range of horsepower and the widest practicable interchangeability of parts. Commercial and scientific developments of the application of pulverized coal, steam and gas turbines, jet propulsion, and power from fissionable materials to rail transportation requirements will be studied for military applications.

Senate Committee Confers About Arabian Oil Papers

Senator Owen Brewster of Maine, chairman of the Senate War Investigating Committee, figured last week that King Ibn Saud of Saudi Arabia and his successors would derive about $5 billions in royalties from American oil companies during the life of the Arabian American Oil Company concession.

Brewster's statement was one of several emanating from members of the committee. Others were that the Department of Justice was interesting itself in the situation and had been supplied with all State Department records dealing with Arabian oil, and that it was anticipated no difficulty would be encountered in getting from President Roosevelt files all documents necessary for the committee's purpose.

Basil O'Connor, one of the executors of the Roosevelt estate, and other custodians of the Roosevelt papers at Hyde Park met with the committee in closed session last week. All relevant documents will be turned over to the committee but the committee's own staff will not be allowed to search through the Hyde Park papers, it was revealed.

Brewster's estimate of the royalties going to Ibn Saud were based on production of the entire 20 billion barrel estimated potential of the Saudi Arabian fields and payment of a royalty of "about" 23 cents per barrel under concessions which run until 1999.

Shell Honors Houston Area Employes on Anniversary

At an anniversary banquet in Houston April 28 Shell Oil Company and associates honored more than 360 employes in the Houston area who have accumulated ten or more years of service with the company. Of this number 184 have between 10 and 15 years' service, 99 have between 15 and 20 years', 72 have between 20 and 25 years', and 12 have 25 or more years' service.

A. J. Galloway, vice president, Shell Oil Company, welcomed 58 new members into the Ten-and-Over Club. H. H. Anderson, vice president of Shell Pipe Line Corporation, was master of ceremonies, introducing Galloway, who was principal speaker, and T. E. Swigart, president of Shell Pipe Line Corporation, who introduced the new members employed by Shell Pipe Line Corporation.

Two Books by Geological Society Are Announced

Two publications to be released shortly by the Houston Geological Society are as follows:

"Rockhounds of Houston" by Alva C. Ellisor describes activities of former and present members of the society and gives an outline of the early history of oil along with activities of the pioneer geologists of the Gulf Coast. Cost, $2.

A volume on the results of the study groups covers 1) Well Logging on the Gulf Coast; 2) Stratigraphic and Structural Distribution of Coastal Reservoirs; and 3) Evaluation of Oil and Gas Properties. Cost, $2.50.

Orders address Secretary A. F. Childers, Jr., P. O. Drawer 2100, Houston 1, Texas, with checks payable to the Houston Geological Society.

Collerain and Lyle Named To Head Electrical Groups

With approximately 300 registrants and two-thirds that number of local guests, the Petroleum Industry Electrical Association and its associate, the Petroleum Electric Supply Association, closed out a three-day meet in Houston, by naming officers as follows:

For PIEA—President, J. F. Collerain, Houston Pipe Line Company; Vice President, D. H. Levy, Magnolia Pipe Line Company, Dallas; and secretary-treasurer, R. C. Appling, United Gas Pipe Line Company, Shreveport (re-elected).

For PESA—President, E. C. Lyle, Westinghouse Electric Supply Company, Houston; Vice President, C. A. Heiser, Anaconda Wire & Cable Company, Dallas; and secretary-treasurer, R. A. Breese, General Cable Corporation, Dallas (re-elected).

The 1948 meeting was scheduled for the first week of May, in Dallas.

PIEA offered eight technical papers, among them being "Electric Power Requirements for Refinery's New Chemical Processes," by H. M. Stewart, Chief Electrical Engineer, Humble Oil & Refining Company, Houston; "Prospective Use of Electrically-Driven Centrifugal Blowers for Gas Pipe Line Transmission," by W. H. Stueve, Oklahoma Gas & Electric Company, Oklahoma City; and a report on "Petroleum Industry Radio," by F. W. Littell, Shell Pipe Line Corporation, Houston. Other topics discussed were "Two-way Radio for Petroleum Industry," by R. J. White, Philco Radio Corporation; "The XY Switch," by M. A. Clay, Stromberg-Carlson Company; "The Magic of Electronics," by Gordon Volkenant, Minneapolis-Honeywell Company; "Telephone Interference Factor of Industrial Machines," by G. L. Oscarson, Electric Machinery Manufacturing Company; and "New Materials and Their Uses in Design of New Equipment," by F. R. Benedict, Westinghouse Electric Corporation.

API Reorganizes Permian Basin Production Division

D. A. Miller, Phillips Petroleum Company, Midland, Texas, was elected chairman of the Permian Basin Chapter of the American Petroleum Institute's Division of Production at the recent reorganization meeting at Odessa, Texas.

Other officers elected included R. B. Saxe, Gulf Oil Corporation, Odessa, first vice chairman; F. R. Lovering, Shell Oil Company, Odessa, second vice chairman; and J. N. Dunlavey, Skelly Oil Company, Hobbs, N. M., third vice chairman.

Jay Boxell, Phillips Petroleum Company, Midland, appointed secretary-treasurer, announced that the membership totals 283 and that a goal of 800 members had been set before the next meeting at Odessa May 31.

William J. Murray, Jr., member, Texas Railroad Commission, was speaker at the reorganization meeting in Odessa. He stressed the importance of increasing recovery in the West Texas area where it averages from 20 to 40 percent of the oil in place. He challenged the operators to find ways to do the job better.

Chairmen of committees so far appointed include R. B. Saxe, Gulf Oil Corporation, Midland, program; C. C. Roripaugh, Shell Oil Company, Midland, publicity; M. R. Hayes, Phillips Petroleum Company, Odessa, entertainment; M. M. Conn, Atlantic Refining Company, Odessa, meeting place and arrangements; F. R. Lovering, Shell Oil Company, Odessa, membership.

Oil Scouts and Landmen Meeting Set This Week

Speakers for the twenty-fourth annual convention of the National Oil Scouts and Landmen's Association (Roosevelt Hotel, New Orleans, May 15-17) will include Wade O. Martin, Jr., Louisiana secretary of state; deLesseps S. Morrison, mayor of New Orleans; Joseph L. McHugh, Commissioner of Conservation, Louisiana; R. G. Rice, vice president, Tennessee Gas & Transmission Company, and Ralph Graham, chief geologist, Tennessee Gas & Transmission Company.

H. Layton Jones, Freeport Sulphur Company, is convention chairman.

Crude Oil Production in the United States

(Estimates compiled by THE OIL WEEKLY. All figures indicate daily averages in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED May 10	May 3
Alabama	700	400
Arkansas	74,500	73,600
California	911,300	910,200
Colorado	37,700	37,800
Florida	460	540
Illinois	189,400	185,700
Indiana	18,900	18,950
Kansas	278,650	276,500
Kentucky	25,000	25,500
Louisiana	413,300	410,900
North Louisiana	97,300	96,700
South Louisiana	316,000	314,200
Michigan	40,000	42,000
Mississippi	91,050	88,300
Missouri	100	100
Montana	22,500	23,000
Nebraska	600	600
New Mexico	105,850	103,985
New York	13,550	13,350
Ohio	9,000	8,700
Oklahoma	385,700	385,800
Pennsylvania	35,700	35,150
Tennessee	25	25
Texas	2,226,850	2,183,500
Tex. R.R. Comm. Districts:		
Dist. 1—South Central	21,100	20,850
Dist. 2—Middle Gulf Coast	159,160	158,330
Dist. 3—Upper Gulf Coast	485,170	481,990
Dist. 4—Lower Gulf-S.W.	243,420	242,330
Dist. 5—East Central	38,360	38,130
Dist. 6—East Texas Field	338,000	335,860
Dist. 6—Rest of Northeast	112,500	111,770
Dist. 7-B—North Central	38,200	37,360
Dist. 7-C—West Central	36,790	36,440
Dist. 8—West	530,130	498,570
Dist. 9—North	137,800	136,660
Dist. 10—Panhandle	86,220	85,260
West Virginia	7,600	7,500
Wyoming	113,750	116,000
Total United States	5,001,485	4,947,300

Total stocks, foreign and domestic, May 3, as reported by the Bureau of Mines were 237,140,000 barrels.

Study of Reservoir Oils At Elk Hills Is Released

A report on the reservoir oils of Naval Petroleum Reserve No. 1 (Elk Hills, Cal.), prepared by the Bureau of Mines in 1945, has been released for free distribution. The report, used by the Navy together with other information, to calculate reservoir performance and oil reserves, is a representative review of the physical properties of reservoir oils in the partly depleted shallow zone of the Elk Hills field.

Also included are calculations used with flow tests at a new well in the above Bittium sand, on which a unique application of concepts to the reservoir showed that a substantial source of reservoir energy had been tapped, leading to the drilling of a successful offset well and aiding development after two other offsets had failed.

In addition, a new method is presented for obtaining produced oil samples from pumping wells that minimizes the effect of daily and seasonal variations in temperature on their gravities.

Gulf Officials on Tour

A party of eastern officials and stockholders of Gulf Oil Corporation, headed by J. Frank Drake, president last week was making an inspection tour of Gulf properties in the Mid-Continent and the Southwest.

In addition to the eastern group, there are J. H. Russell, vice president; Ben C. Belt and H. B. Fuqua, assistants to the vice president; N. H. Perry, vice president, pipe line; and O. H. Carlisle, division manager, sales, all of Houston; Rush Greenslade, vice president of Gypsy Division; P. H. Bohart, assistant to the vice president, and S. G. Sanderson, manager of production, all of Tulsa.

Bureau of Mines Report Discloses February Gain

February crude production averaged 4,810,000 barrels daily, an increase of 139,000 barrels over January, while demand for domestic crude averaged 4,775,000 barrels, an increase of 57,000, according to the monthly Bureau of Mines report. .

Oil-well completions dropped 18 percent, from 1453 to 1196 and the number of active rigs dropped from 3760 to 3620.

With crude demand slightly under production, stocks increased at an average of 35,000 barrels daily and during the month total stocks, domestic and foreign, increased from 229,432,000 to 230,911,000 barrels.

Refined stocks, however, declined 12,300,000 barrels to 246,636,000 barrels at the close of the month.

The bureau reported that total demand for all oils set a new monthly record of 6,045,000 barrels daily, including exports of 479,000 and domestic demand of 5,566,000.

Imports of all oils averaged 501,000 barrels daily and total withdrawals from stock amounted to 378,000 barrels a day.

The price index for crude and products, as shown by the Labor Bureau statistics, was 76.6 in February, against 76.5 the preceding month and 61.1 in February, 1946. The crude capacity represented in the report was 5,084,000 barrels, indicating an operating ratio of 85 percent, compared with 94 percent in January.

Judd Heads Suppliers Who Discuss Industry Problems at Annual Meet

Ardon B. Judd, general manager of Republic Supply Company, Houston, was elected president of the Petroleum Equipment Suppliers Association, and A. W. McKinney, general manager of National Supply Company, Toledo, was elected vice president of the annual meeting in San Francisco last week. Directors were chosen as follows:

Ardon B. Judd

Eastern District: George H. Alten, Karl Elliott, Dave Fox, Jene Harper, O. M. Havekotte, Mason Jones, A. S. Knowles, Donald W. Mackie, Frederick F. Murray, A. W. McKinney, Ferd J. Spang, H. Bernard Wehrle.

Mid-Continent and Rocky Mountain District: George Hayes, Joe Eustice, S. P. Wallace, W. M. Bovaird, H. B. Gutelius, W. H. Larkin, Earl W. Miller, Walter O'Bannon, J. L. Shakely, Guy A. Thompson, Jay P. Walker, Carl White, Jr.

Southwestern District: L. Norvell, Ken W. Davis, Allen Guiberson, R. G. Hamaker, Frank Hereford, Ardon B. Judd, E. L. Lorehn, Fred Mayer, Ralph Neuhaus, George O'Leary, W. B. Sharp, Wallace D. Wilson.

Pacific District: Wandell Jones, J. C. Axelson, Markley C. Brown, J. A. Crawford, E. S. Dulin, Rodney S. Durkee, D. S. Faulkner, H. H. Glen, H. E. Howard, Warner Parker, John J. Pike, Ted Sutter.

Paper Work Burdensome

Necessity of reducing the amount of "paper work" involved in handling of supply store sales to oil companies came in for interesting discussion both on the part of suppliers and oil companies. The subject was handled through a panel comprising R. A. Schell, National Supply Company; R. D. Hilborn, Jones & Laughlin Supply Company; John H. Lollar, Republic Supply Company; A. B. Ripley, Republic Supply Company of California, and R. M. Morrison, general purchasing agent, The Texas Company.

Discussion developed that "paper work" is costing more than the profit on many items sold in supply stores, and is becoming a burden, insofar as oil companies are concerned.

Morrison said that a study of invoices showed that 80 percent of the "paper work" was taken up by only 20 percent of the dollar value of the purchases involved, and a later speaker said that in the case of one supply company 50 percent of its invoices covered only 1½ percent of the company's dollar volume.

Various suggestions were made—one to the effect that on many items of small monitory value, a penalty charge might be necessary in some instances to keep the sale from resulting in actual loss.

Morrison urged that suppliers work out a plan which would make the "paper work" less burdensome, and said that last year The Texas Company had eliminated 40,000 emergency orders, substituting therefor blanket orders.

It was pointed out that the problem had become such a serious one that the closest cooperation between supplier and oil company is necessary to its solution, and the resolution adopted was considered a preliminary move toward such cooperation.

Supply Store Problem

It was apparent as a by-product of the discussion that the burden of maintaining supply stores in spots of comparative inactivity is one which is again worrying supply companies.

Labor relations was the subject of Frank Rehm, vice-president, Industrial Relations and Personnel of Shell Oil Company, while Don Gilman, vice-president, Western Oil and Gas Association, spoke on "Public Relations on the Part of Trade Associations."

Ray L. Dudley, president of The Gulf Publishing Company, announced that the edition of the Composite Catalog which will be out late in Autumn of this year will have a life of 18 months instead of one year as heretofore excepting during the war period.

Excellent provisions for entertainment and comfort of guests were made by the West Coast Division of the Association, with Bill Brooks of Byron-Jackson as chairman of the entertainment committee.

Los Angeles API Program

Two major papers of general interest, as well as the nine technical discussions previously announced, will be presented during the Spring meeting of the production section, California district, American Petroleum Institute, May 15-16 at the Los Angeles Biltmore.

John M. Lovejoy of New York, president of Seaboard Oil Company, will discuss "A Progressive Public Relations Program for the Oil Industry" and J. E. Toussaint, general manager of the production department of Standard of California, will speak on "Organization Elements, Their Relation to Oil and Gas Producing Operations."

Texaco Buys Leases

The Texas Company has acquired 2 5-acre leases in the Joiner sector of the East Texas field from A. Byron Diffie and associates. The properties involve the Deason and Pinkston tracts, bearing 5 wells that were recently acquired by Diffie et al from J. Fred Schoellkopf of Dallas for $283,000 cash.

Negotiated Bids Sought For Canol No. 1 Project

Having rejected all bids for the purchase of Canol No. 1, the Foreign Liquidation Commissioner is looking for customers who will buy the project on a negotiated basis.

While a score of bids were received last month, the highest offer was only $1.5 million for the facilities, which cost the government something like $70 million.

Officials said they had no prospective purchaser in mind, but felt that the fact a number of bids were received evidenced that there was considerable interest in the pipe line facilities and equipment offered in a package.

Texas MER Hearings

The Texas Railroad Commission's survey to determine the maximum efficient producing rate for every Texas oil field was in full swing last week. Operators in Gulf Coast District 3 and Southwest Texas District 4 gathered in Austin and presented evidence which generally indicates that producing capacities have been affected little since the general survey made last summer.

Hearings yet to be held include East Central Texas District 5 on May 13, East Central Texas District 6 on May 14, West Central Texas Districts 7-B and 7-C on May 15, West Texas District 8 on May 20, and North Texas District 9 and Panhandle District 10 on May 23.

Gas Measurement Course

Approximately 900 men in the oil and gas industry attended the 22nd annual Southwestern Gas Measurement Short Course at the College of Engineering, University of Oklahoma at Norman last week.

D. A. Hulcy, president of Lone Star Gas Company, delivered the opening address.

The course is sponsored by the University annually for the purpose of providing an opportunity for individuals in the industry to study common problems.

Independents to Meet

The executive committee of the Texas Independent Producers and Royalty Owners Association will meet Wednesday, May 14, in Corpus Christi, H. J. (Jack) Porter, Houston, president, has announced.

Col. Ernest O. Thompson, Olin Culberson, and William J. Murray will be honor guests at a dinner that evening.

Baytown Observance

Humble Oil & Refining Company's Baytown, Texas, refinery processed its billionth barrel of crude oil last week.

This plant, largest in the nation, charged its first crude to stills in May, 1920.

The original capacity of the refinery was 10,000 barrels daily but it has been steadily expanded and during April of this year the Baytown plant set an all-time high monthly crude charge record of 213,000 barrels a day.

Work Bench Discussions Are Feature Of Mid-Year Meeting of Independents

With more than 200 members from oil-producing states present the Board of Directors of the Independent Petroleum Association of America held its mid-year meeting in Jackson, Miss., last week.

Chief interest was focused on the acute problems that are affecting the independent oil operator and the industry now with the emphasis being laid on the severe shortages of material such as pipe.

Highlights were the work bench discussions at which President B. A. Hardey and Russell B. Brown, general counsel discussed taxes, reciprocal trade agreements, the Anglo-American pact, tidelands, public lands and imports; and the forum on foreign oil which took place Friday afternoon. Also of great interest was an address on "Government Regulation and Free Enterprise" by Senator Joseph C. O'Mahoney of Wyoming; and an address on "Oil and Reciprocal Trade Agreements" by Dr. John Lee Coulter, economic consultant of the NAM.

E. D. Kenna, executive vice president Mississippi Division of the Mid-Continent Oil & Gas Association, said that in March, 1947, oil was being produced from 818 wells in 20 Mississippi fields.

Alec Crowell, petroleum consultant, another scheduled speaker, was detained but excerpts from his talk were read.

Crowell wrote that there is more technical and geological information publicly available on the oil and gas wells, reservoirs and field of the Southeastern States than any comparable area in the world. He estimated that the proved reserve of oil and condensate in Alabama, Florida and Mississippi is 423,846,000 barrels and the reserve of natural gas is 3,145,500,000,000 cubic feet. He added that Mississippi led all oil producing states in added proved reserves of oil for 1945 and 1946.

Efficient Rates Exceeded

Mississippi is producing 33 percent more oil than should be produced if the ultimate recovery of oil and gas is to be obtained; and if present practices are continued Mississippi stands to lose 80 million barrels of oil, he declared.

Major Hardey recalled that at the end of the war the association sought to stabilize industry and get rid of unrealistic controls with "some objectives achieved but a lot remaining to be done." Hardey said we are losing our export market and "in years to come it probably will be confined to export of specialty products."

Russell Brown mentioned the Anglo-American oil agreement and said that the hearing on it probably will come before a Senate committee within the next two weeks. The association went on record last October as opposing it.

Referring to the tidelands bill, Brown said any decision by the Supreme Court will not be conclusive in that further legislation will be needed.

Brown said that at present about 500,000 barrels a day are being imported and that such an amount would be dangerous if demand for petroleum products was not high. "The association previously passed a resolution restricting imports to a point where they would not affect domestic production and now something should be done to implement the resolution," he said.

Brown said that there is no present shortage of domestic oil and the apparent decrease in discovery of new reserves has been due to restrictions placed on the industry and shortage of materials. To correct the deficiency in drilling 2 million net tons of steel tubing are required. He recommended that the association try to obtain additional steel and to instigate an investigation of the domestic steel shortage.

O'Mahoney Speaks

Senator O'Mahoney said four things should be done:

1) Tax laws which restrain private capital should be enforced.

2) A law should be passed making all companies doing business in U. S. and foreign countries to file with the government text of contracts which they make with foreign governments.

3) Laws should be made to close gap in existing laws against monopolistic mergers.

4) Congress should regulate but not control commerce which is carried on within its jurisdiction.

Minor S. Jameson, Jr., economist of the IPAA said that there is no longer a question of whether foreign oil is a threat to domestic producers but how soon and how severe they will be.

"New drilling in the U. S. can change the temporary condition of relatively tight crude supplies," he said. "During the past year additions to proved reserves averaged 28 barrels for every foot drilled contrasted with 26 barrels during the seven prewar years. There is no lack of oil, but the drilling is still 20 percent subnormal as compared with prewar rate."

Howard Page, economist for Standard Oil Company (New Jersey), said that the worldwide industry is in for a period of expansion, and that little if any spare capacity will be available so the problem will be one of expanding fast enough to meet demand in full. He said that 1951 requirements will be 30 percent above 1946 or almost 2 million barrels a day. Of this domestic demands will increase 23 percent and foreign demand 43 percent. He said that eventually foreign requirements will be supplied from foreign sources, but that the task of building foreign refineries is so great that exports from the U. S. will be required well beyond 1951.

"The oil industry is going to have an enormous job on its hands," he concluded. "It is no longer faced with surpluses. The immediate problem is to provide adequate supplies."

L. F. McCollum, vice president of Standard Oil Company (New Jersey), said the time has passed when domestic producers could ignore the situation abroad. "It is conceivable that the domestic industry rather than fear a flood of imports may well seek an increase in the very near future," he said. It is doubtful if any substantial increase in imports could be made available to help the present domestic situation, due to the worldwide supply problem.

Harold B. Fell, executive vice president of IPAA, thought that an import policy is part of national oil and gas policy and that a program should be developed to effectuate it. He favored incentives to promote the search for new deposits within our borders and also suggested that American companies be encouraged to develop foreign reserves to meet foreign demands and to have oil available in foreign lands for the use of our armed forces.

Dr. Coulter said that some people feel that since we are the world's leading industrial nation we must assume responsibility for the development of petroleum production in all parts of the world. This could have a great bearing on the prosperity of all domestic independent petroleum producers, he pointed out. "The Trade Agreements Act expires in about a year and every effort should be made if that program is extended it shall be so thoroughly revised as to make sure that in the years ahead our own economic welfare is given first consideration," he concluded.

Natural Gas Problems

Russell Brown, in discussing the proposed amendment to the Natural Gas Act, said the amendment proposed by the industry's committee would correct present FPC philosophy and is designed to give the producer a better price for his gas. A congressional hearing has been held but no early decision is expected.

N. C. McGowen, president United Gas Corporation, stated that gas reserves in place are at their highest levels and continue to increase in spite of withdrawals. Communities adjacent to a field usually have been unable to absorb its production and producers have sought markets elsewhere in order to make production profitable, he said.

"Everyone connected with the production and transportation of gas is entitled to a fair division of that which is received but in the end the proper wellhead price is that which the market can stand," he declared.

The association passed a resolution directing the president to appoint a committee to investigate material shortages and to take whatever action necessary to alleviate those shortages. Another resolution directed that the association's officers urge Congress to make the greatest practical reductions of appropriations for government activities; but that certain activities relating to the petroleum industry are in the public interest and that when such activities are found to be essential they should be maintained.

Research Ability of Japs is Praised In Report of U.S. Technical Mission

With a stockpile of 60 million barrels of crude petroleum and products at the time of Pearl Harbor, Japan in the last year of the war was reduced to making fuels and lubricants from such sources as pine root oil, vegetable oils and sweet potato alcohol, a report by the Navy Technical Mission in Japan, released through the Department of Commerce reveals.

Late in 1941 Japan had available, against wartime requirements of about 30 million barrels a year, a crude refining capacity of 35 million barrels and an ambitious "seven-year synthetic oil plan" which, however, never developed more than 114,000 tons a year, only a fraction of that programmed.

The Japanese navy built elaborate underground storage tanks, generally of reinforced concrete, buried in the hills and camouflaged with heavy vegetation. The largest single reservoir inspected, located at Sasebo, had a capacity of 600,000 barrels.

Coal hydrogenation was studied more intensively in Japan than in any other country except Germany, and to encourage domestic technology Japanese officials blocked attempts to purchase patents covering the Bergius process used with success in Germany. Lacking background, attempts to use the hydrogenation process on a large scale were not entirely successful and only two hydrogenation plants were installed. Fischer-Tropsch plants, however, were built on German models and with German equipment, although Japanese research made at least one original contribution to the process by developing an iron catalyst for the synthesis reaction.

When her supply routes to the East Indies were destroyed, Japan intensified efforts to produce fuels and lubricants from, pine root oil, soya bean oil, rubber, sweet potato alcohol, camphor, orange peel, birch bark and pine needles. At the war's close a program was underway for installation of 36,000 pine root oil retorts to produce 2½ million barrels of oil annually.

The Japanese navy was a leader in oil research, building and operating extensive refineries and at the end of the war eight navy depots were operating and were engaged in fuel and lubricant research, petroleum refining, coal mining and carbonization, and crude oil and synthetic oil production.

The mission stated that although Japanese technology followed American and foreign practices before the war, Japanese scientists showed initiative in modifying their techniques to meet changed conditions, and the investigators believe it a fallacy to underestimate the research ability of Japanese scientists, reporting that progress has been "conspicuous" and within the next few decades "Japan may well become one of the foremost technical nations in the world."

A number of reports on Japanese fuel and lubricant developments believed to be of potential value in America have been made available through the Office of Technical Services, Department of Commerce.

Gas, Bottled at De Mares, New Fuel for Colombians

Bucaramanga, in Colombia has been selected as the site of the first installations of domestic equipment to utilize bottled gas for home fuel to be manufactured by LPG Company. The company, owned 50 percent by Tropical Oil Company, has received much equipment for manufacture of the bottled product as well as stoves for using, it and installations are under way.

The bottled gas is to be made from natural gas at the Tropical Oil Company plant on the De Mares concession, and widespread use of this type fuel is desirable from the standpoint of conservation. Charcoal is the principal fuel now used, and areas around the principal cities are being denuded of forests. Clearing of large areas through past decades has resulted in an actual change in the climate in some regions and a complete loss of agricultural value.

Efforts are also being made to popularize oil stoves using fuel such as kerosine.

Heads Pantepec

C. U. Daniels became president of Pantepec Oil Company of Venezuela, C. A., on May 1, 1947. In advancing to the top executive position in Pantepec, Daniels moved up from the general managership, a post he accepted in October, 1946, after resigning as vice president of Oklahoma Natural Gas Company, As Pantepec president, he succeeds Warren W. Smith, retired after 23 years with the company.

C. U. Daniels

Daniels has spent his entire business career in the petroleum industry both as an independent operator and with major companies.

Germany Completions

Well completions in the British occupied zone of northwest Germany during 1946 totaled 110, of which 49 were productive. Total footage drilled in this zone was 261,337 feet.

Of the wells drilled, 21 were exploratory tests, one of which was productive. Wells drilled in proven fields totaled 89, of which 48 were productive.

Venezuela Is Undisturbed By Near East Oil Threat

Dr. Perez Alfonso, Venezuelan minister of materials, in an informal appearance at a recent meeting of the federal government Interdepartmental Committee, is understood to have given his government's thinking as to why it felt that revenues from Venezuelan oil production should be divided between the government and the concessionaires more nearly on a 50-50 basis. Venezuela is looking ahead to the day when its oil resources no longer will be so important and seeks development of other industries to take its place, he explained.

Venezuela currently has no excess exportable oil and while new pools may be discovered there is no present assurance that new finds will be as prolific as those now being exploited, he pointed out. The minister appeared to be undisturbed by the prospect of big-scale production in the Middle East, apparently confident that Venezuelan oil could hold its own in this hemisphere.

Natural Gas Liquefication And Storage Near Moscow

Soviet authorities have contracted with an American firm for the construction of a plant for liquefication and storage of natural gas, according to a press report from Moscow. The primary purpose of the plant is to take care of peak loads and for standby service, it is understood, and construction, scheduled to start soon, may be completed by late 1949 and take its place in the supply situation for Moscow.

Estimated cost of the project is $6 million and the plant is to have a capacity to liquefy 4 million cubic feet of natural gas a day. The gas is to be taken from the existing Saratov-Moscow pipe line and will be stored in liquid form to be used in emergencies.

Cuban Production

Production of light gravity oil in the Jarahueca field, Cuba, during the first two months of 1947 was estimated at 40,000 barrels. Output of naphtha in the Motembo field during the same period was 10,000 barrels.

New Trading Company Organized to Aid Roumania

Formation of the American Roumanian Trading and Development Corporation to foster and develop trade between Roumania and the United States, has been announced and Ralph P. Bolton, Standard Oil Company (New Jersey), has been elected president.

The new company will open an important trade channel and by this development, Roumania's purchasing power abroad will be increased and aid given to raising the standard of living within the country, Bolton said.

The corporation has been formed as a non-profit organization and registered in New York state with an authorized capital of $1 million.

Magnolia West Texas Line Is Extended to New Mexico

Magnolia Pipe Line Company is extending its West Texas pipe line system into New Mexico by constructing 17 miles of 8-inch from its Fullerton field station, Andrews County, thence west to the Nelson 3-well Ellenburger area, and 6 miles of 4-inch from the Nelson field to its Eunice townsite, New Mexico, gathering system.

The latter system was installed last year to gather Magnolia Petroleum Company's sweet crude from the Brunson area's Ellenburger production and semi-sweet crude from the Yeso in the Drinkard area, and currently totals 1350 barrels daily. This oil and about 1600 barrels daily gathered in the Vacuum field by Magnolia is moved through The Texas New Mexico Pipe Line Company's trunk line to Halley station, Winkler County, where it enters Magnolia's system.

R. H. Fulton & Company, Lubbock, Texas, was given contract to install the extension, and pipe has been delivered.

Colorado-Wyoming Project Work Will Commence Soon

Enlargement of Rocky Mountain Pipe Line Company's Colorado-Wyoming pipe line at a cost of $2,300,000 will get underway soon. The company is a subsidiary of the Continental Oil Company. The pipe line company's expansion follows recent announcement of a $4 million construction program to double the size of Continental's Denver refinery.

Rocky Mountain's lines include an 8-inch line from Lance Creek to Cheyenne, Wyo., and a 6-inch line from Cheyenne to Denver. At Guernsey, Wyo., the line intersects others, bringing crude oil from the Rangely and Elk Basin fields, as well as lines from other Big Horn Basin and Wind River Basin fields, and the Salt Creek field.

Enlargement will include the laying of an entirely new 10-inch 118-mile line from the Horse Creek station north of Cheyenne to Denver and looping with additional 8-inch pipe a part of the line from the Guernsey station to Horse Creek. The new line is expected to be completed late in 1948.

When completed, the enlarged line will handle at least 26,000 barrels of crude daily. Additional pump stations would substantially increase this capacity.

Artesia Relief Planned

Stanolind Pipe Line Company is reported planning to provide market relief for pipe line prorated areas in the Artesia district of New Mexico through the construction of an 80-mile 8-inch extension of its West Texas system from Sundown station, Hockley County, via unconnected wells in the west sector of the Slaughter field and the Landon 2-well pool, Cochran County, thence to the Cap Rock field, centering upon the Lea-Chaves County line, New Mexico. The Cap Rock 80-well field, subject to pipe line proration, is currently producing about 1100 barrels of its 2800 barrels daily allowable.

West Texas Crude Shipments to Exceed Wartime Volume Within Next 30 Days

All tank cars available for crude movement will be utilized if crude purchasers and pipe line companies carry out ambitious plans to supplement limited pipe line facilities from Texas and New Mexico fields. Crude shipments scheduled from West Texas will exceed wartime volume within 30 days, and negotiations are pending for others to make rail deliveries to distant refineries if tank cars can be procured.

Magnolia Pipe Line Company will augment its oil movement from the Permian Basin by consigning 10,000 barrels daily, starting June 1 to Magnolia Petroleum Company's Fort Worth refinery. This oil will be loaded from rack at Midland. The company's 2-unit system from Midland to Corsicana averaged 82,100 barrels daily the past week.

Humble Pipe Line Company has booked the required crude supplies to supplement its current pipe line movement, which averaged 113,900 barrels daily the past week from the Permian Basin, to ship 50,000 barrels daily by tank cars from Atlantic Pipe Line Company's Midland rack. Humble has arranged for three companies to relay this oil to the rack.

Humble made initial shipments April 29 on the 15,000 barrels daily to be consigned to Humble Oil & Refiining Company's Baytown refinery. The freight rate on this movement is 19 cents per 100 pounds.

Another 20,000 barrels daily will be consigned starting about May 20, to Standard Oil Company of New Jersey's refinery at Baton Rouge, La.

Humble Pipe Line Company is installing a 76-car capacity dump rack near its Longview station in the East Texas field area to accommodate 15,000 barrels of the 50,000 barrels daily rail shipments scheduled from the Permian Basin. The company is laying 1½ miles of 8-inch discharge line, with pumping facilities to handle 700 barrels of oil hourly, to its Longview station, where the oil will enter its East Texas-Baytown system. The transfer facilities at Longview are scheduled to be completed about May 20.

Atlantic Pipe Line Company is shipping 5000 barrels daily from Midland to Longview, where the oil is batched through its trunk line from the East Texas field to the Atlantic Refining Company's refinery and tanker terminal at Atreco.

Humble Pipe Line Company has resumed tank car shipments of crude from the Hawkins field, East Texas district, having averaged 8900 barrels daily the past week to Standard Oil Company of New Jersey's Baton Rouge plant. This movement will be stepped up to 12,000 barrels daily.

Toronto Pipe Line Company, which supplies British American's Canadian plants with a portion of their requirements by tank cars from points in East, North and West Texas, has arranged to take the allowable production of the Hardy 7-well field, Jones County. The company recently installed a rack and gathering system in the Lawson and Chapman areas, Haskell County.

Quitman Line Replacement Program Nears Completion

Pan American Pipe Line Company is completing work started last year in replacing with 6-inch pipe the system it acquired from Central Pipe Line Company running from the Quitman field, East Texas, to Pan American's Sabine Station, located in the East Texas field west of Longview.

Last fall Pan American replaced 11 miles of the old line with 6-inch from the Quitman field to Haynesville. The company is presently engaged in replacing the remainder of the line with 6-inch from Haynesville through Hawkins (they will not receive any crude from this field—the old line they are replacing ran through Hawkins) to Sabine station. A 12½-mile leg has been completed with 16½ miles yet to go. Wood Engineering Company, Tyler, is handling construction.

The new 6-inch line will deliver crude produced in the Manziel and Quitman fields and will enter Pan American's trunk line system at Sabine station for delivery to Texas City. Last fall Pan American built a 4-inch line from Manziel field to Quitman field.

Main pump station for the line will be located at Quitman. Another pump station, acquired with the old Central system, is located at Hawkins.

Great Lakes Setup Includes 4000 Miles of Pipe Lines

Great Lakes Pipe Line Company, made up of refining concerns which have affiliated so their gasolines may be moved to consuming centers in the Middle West, is operating approximately 4000 miles of main and supplementary lines.

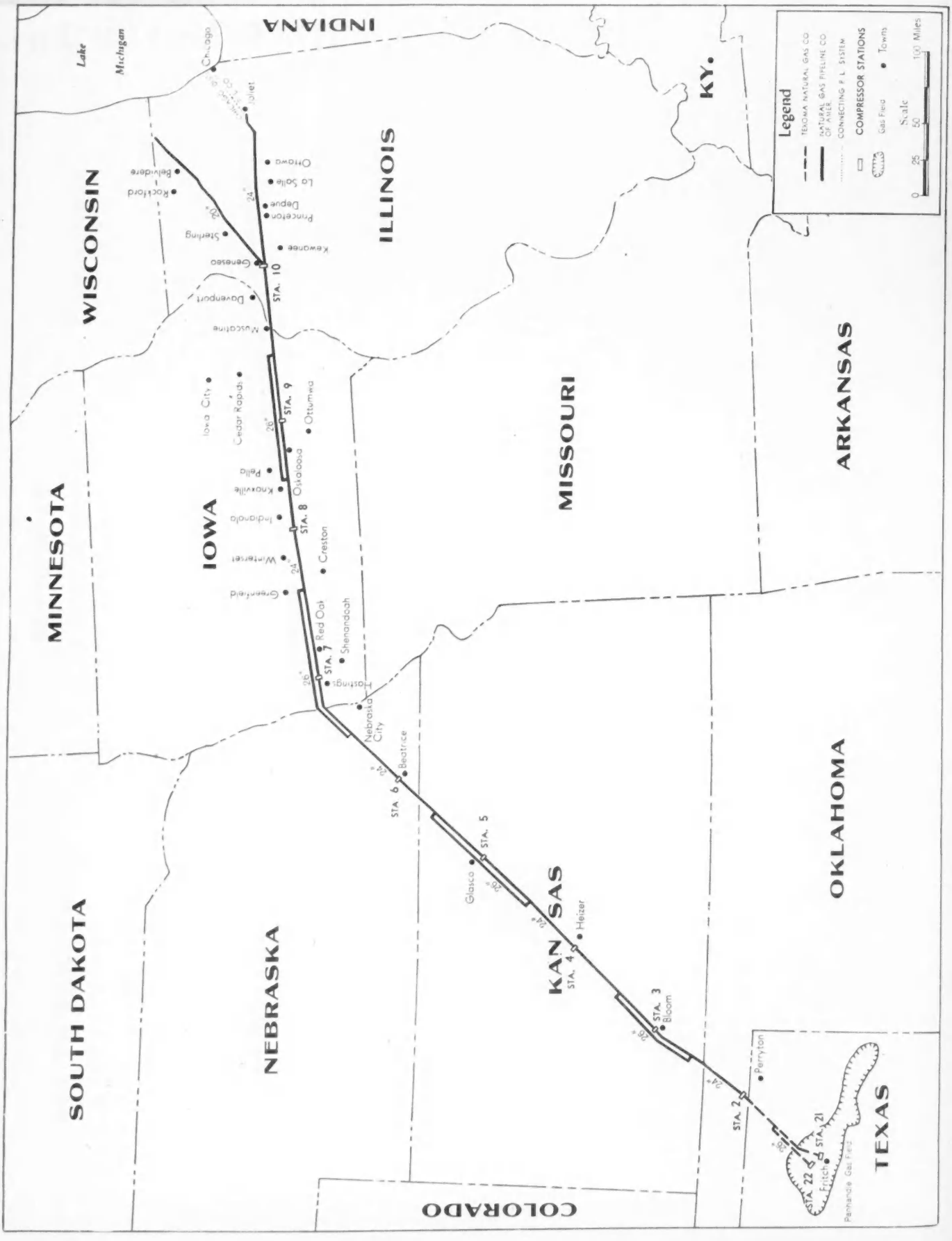
Harry Moreland, vice president and general manager, made the estimate of total mileage while in Tulsa conferring with Sunray Oil Corporation and Wilcox Oil Company officials in connection with the completion of Sunray's 83-mile 8-inch pipe line from Allen, the Sunray plant, to Bristow, Okla., the Wilcox plant, and on to Drumright, where it ties into existing lines of other member companies, and to connections with the main Great Lakes line at Barnsdall. Both Sunray and Wilcox are to tender gasoline for Great Lakes.

The Allen-Bristow-Drumright extension cost $1,200,000 and has a capacity of 30,000 barrels daily. It will carry finished gasolines and other light petroleum products from Sunray and Wilcox refineries to be marketed in the north-central, northwest and adjacent areas.

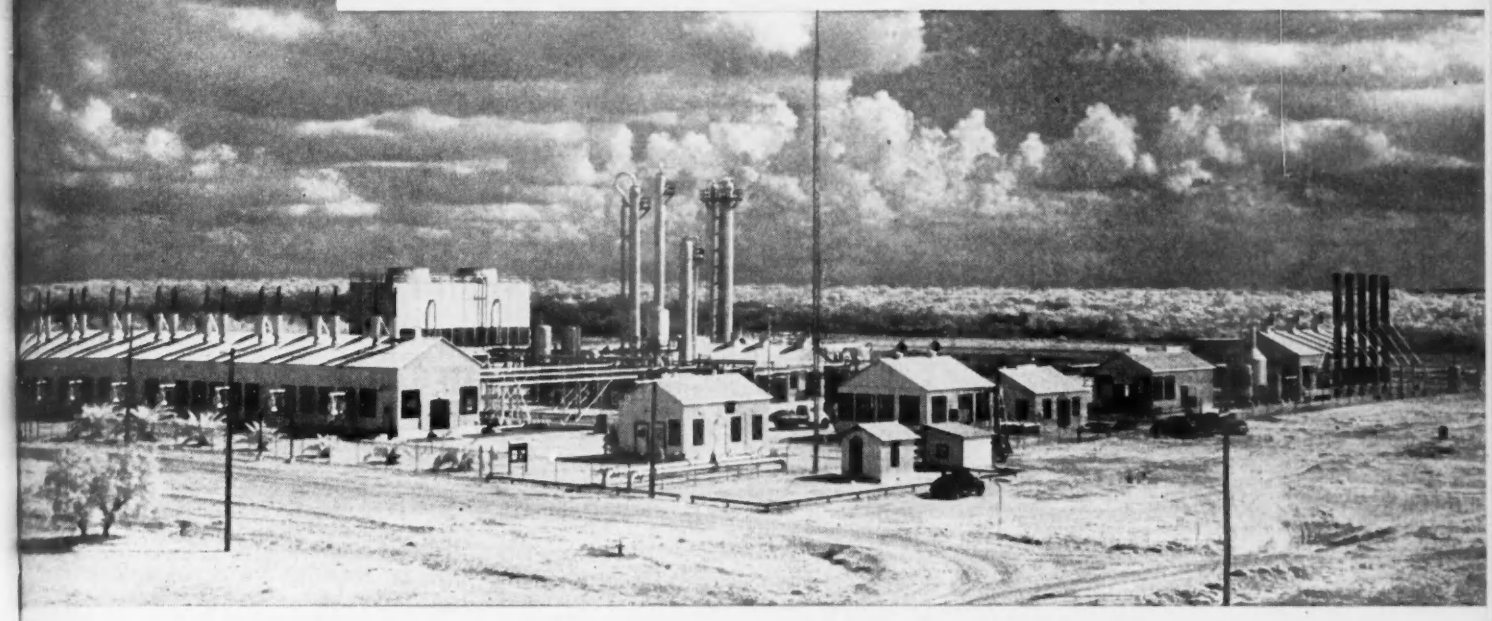
Pipe Lines of the U. S.

Natural Gas Pipe Line Co. of America and Texoma Natural Gas Co.

14th of a Series



CASINGHEAD GAS CONSERVATION BY *Reinjection at Rincon*



Continental Oil Company's Rincon plant produces butane and gasoline and returns dry gas back to the subsurface reservoir. Left to right are compressor plant with eight 600-horsepower compressors, absorption and fractionating towers, radio tower, pump houses and boiler plant for electricity.

IN AREAS where high gas/oil ratios are characteristic and where natural gas markets are poor or non-existent, the operator must take all feasible measures that will result in the economic utilization of the casinghead gas produced with the oil. Indiscriminate flaring of casinghead gas is, generally speaking, a thing of the past and, in cases where it may now be occurring as serious waste, an investigation will doubtless reveal that the condition exists because of certain economic and engineering obstacles beyond the control of the operators. The oil industry has long recognized the value of casinghead gas as a source of supplementing energy required to produce more oil. It endeavors to make this clear to lease and royalty owners and invites them to participate in such projects where good engineering dictates the unitization of diverse properties so that the maximum benefit may be obtained from the utilization of casinghead gas.

An interesting example of practical conservation of casinghead gas is provided at Continental Oil Company's operations in the Rincon oil field, Starr County, Texas. The operator injects into the formation and then processes about 12 million cubic feet of casinghead gas which, in the old and wasteful days, would have been flared.

The Rincon field is about 20 miles northeast of Rio Grande City and is one of the largest in the Southwest, production has been established in several spots over an area about six miles long and from one to three miles wide. It lies on the shallow Frio Sam Fordyce-Kelsey trend and almost merges with the Boyle field on the south and the Cameron field on the north. Most of the productive acreage in the pool is operated by Continental for the account of Rice Institute, W. R. Davis, Inc., and itself.

The field was discovered in January, 1938, when Transwestern Oil Company's Slick Estate 1-B was completed as a condensate well; however, it was not until January, 1940, that the first oil well, W. R. Davis' Slick 6-B, was completed.

Development Rapid

Development of the field was carried out at a rapid rate during 1940 and 1941. Although development slackened appreciably in 1942, drilling operations have been conducted almost continuously since that time. The lenticular character of producing sands makes it impossible to project geological information laterally with any degree of assurance, and in a sense almost every well drilled is a wildcat. On July 1, 1946, there were approximately 150 producing oil wells in the field.

Oil and gas are found in a series of lenticular sands in the Frio section between 3200 and 4300 feet. Although more than 20 separate reservoirs, varying in area from less than 40 to more than 3600 acres, are known to be productive, six reservoirs account for most of the field's known oil reserves.

Crude produced in the field has an average gravity of 41 and a viscosity of about 0.68 centipoise at reservoir conditions. Initial reservoir pressures in the various sands ranged from 1500 to 1850 pounds per square inch.

Permeability of the producing sands at Rincon ranges up to a maximum of 3000 millidarcys and averages about 240 millidarcys. Permeability profiles are irregular, and there is considerable areal permeability variation. Producing sands have an average porosity of approximately 29 percent. As a result of the lenticular character of the sands, none of the Rincon reservoirs has an active water drive; but most of the producing sands do have fairly extensive primary gas caps.

A study, completed after Continental's acquisition of the operation and a half interest in the Rincon properties in November, 1940, resulted in a decision to proceed with a repressure project.

This decision was based primarily on the increased oil recovery anticipated from the maintenance of pressure in lenticular gas-drive oil reservoirs and on the future value of the gas conserved, looking forward to final use of the residue gas by sale through some gas utility for fuel and industrial power. Additional savings were anticipated from the deferment of artificial lifting equipment installations and future utilization of compressor capacity for gas-lift and gas sales service.

Operating pressures required were by modern standards fairly low; reservoir conditions, although not ideal, presented no unusual problems. Lack of a suitable water supply required special consideration in the plant design but was not an important factor in the overall analysis of the project.

In most fields the presence of several operating interests and numerous small leases create serious problems in connection with gas injection programs. Unusually favorable ownership conditions moderated these problems at Rincon. The relatively few large leases owned and operated jointly by Continental and partners covered most of the productive area in the field.

The initial pressure maintenance plant, consisting of two 600-horsepower angle-type compressors, was placed in opera-

tion in May, 1941. The two compressors had a combined rated capacity of 5 million cubic feet of gas per day at a discharge pressure of 2000 pounds. Field separators were operated at approximately 50 pounds, and the plant suction pressure ranged from 35 to 40 pounds.

In laying out the compressor station, provision was made for future expansion of the compressor plant and installation of gasoline extraction and process equipment. Headers and lines were installed to facilitate connection of future equipment and to avoid the necessity for relocation. The compressor building and various auxiliary facilities were located so as to provide a convenient and adequate process area and to permit the almost unlimited enlargement of the compressor plant.

Salinity of the local water supply dictated installation in the original plant of radiator cooling for jacket water, lubricating oil, and interstage gas. All makeup jacket water required treatment, and the water necessary for the initial fill was hauled in from sources outside the field.

Although no gasoline extraction equipment was provided in the initial plant, a small amount of condensate was obtained from the interstage scrubbers. The condensate production was accumulated in a pressure storage vessel and run periodically to the pipe line.

An additional 600-horsepower unit was placed in operation during March, 1944, in order to take care of increased gas production from added development. This engine raised the total rated capacity of the compressor plant to approximately 7.5 million cubic feet daily.

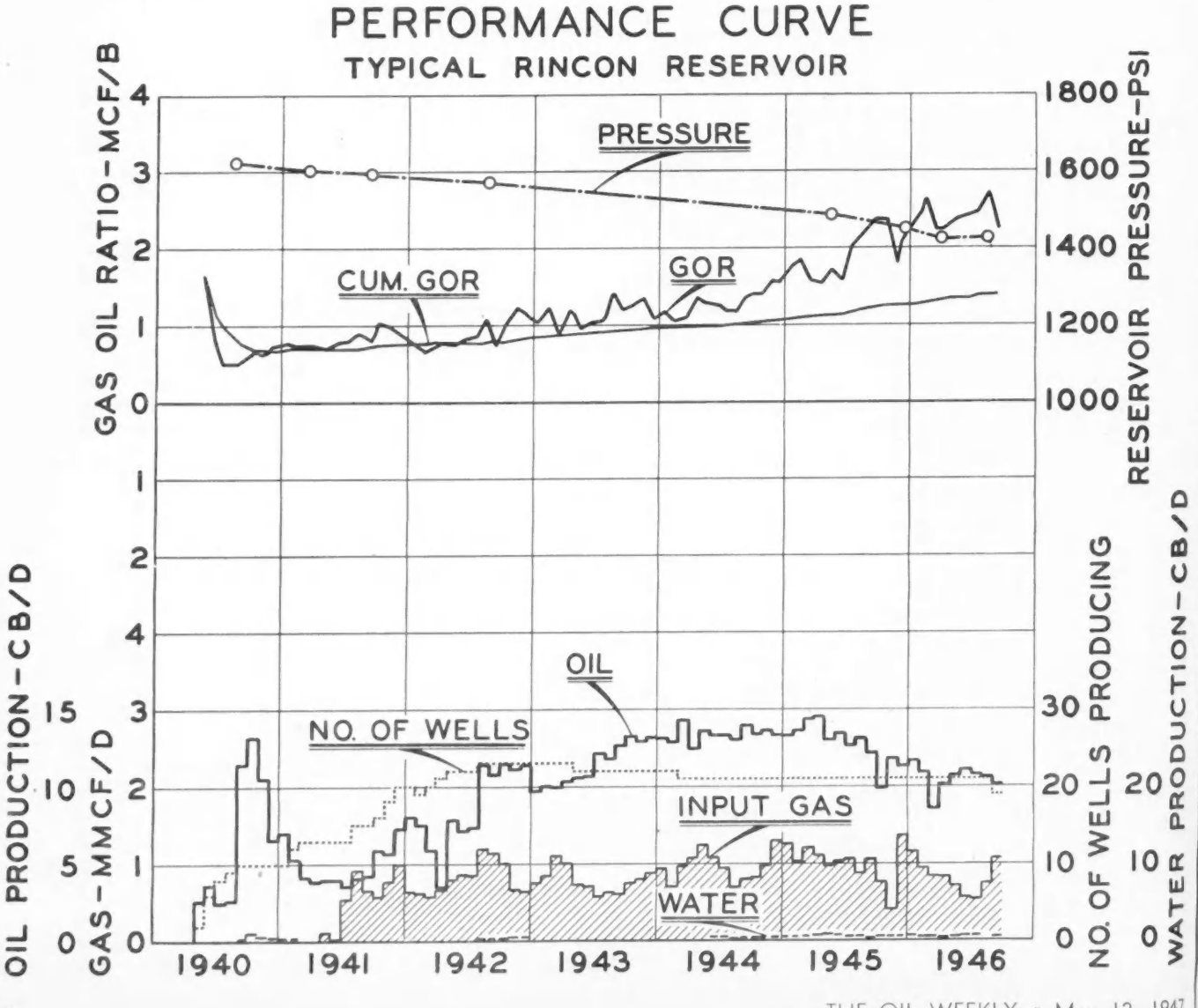
Although delayed considerably by wartime shortages of material and labor, a complete gasoline plant was put into operation in November, 1945. Five additional 600-horsepower compressors were also installed, raising the plant total to 4800 horsepower.

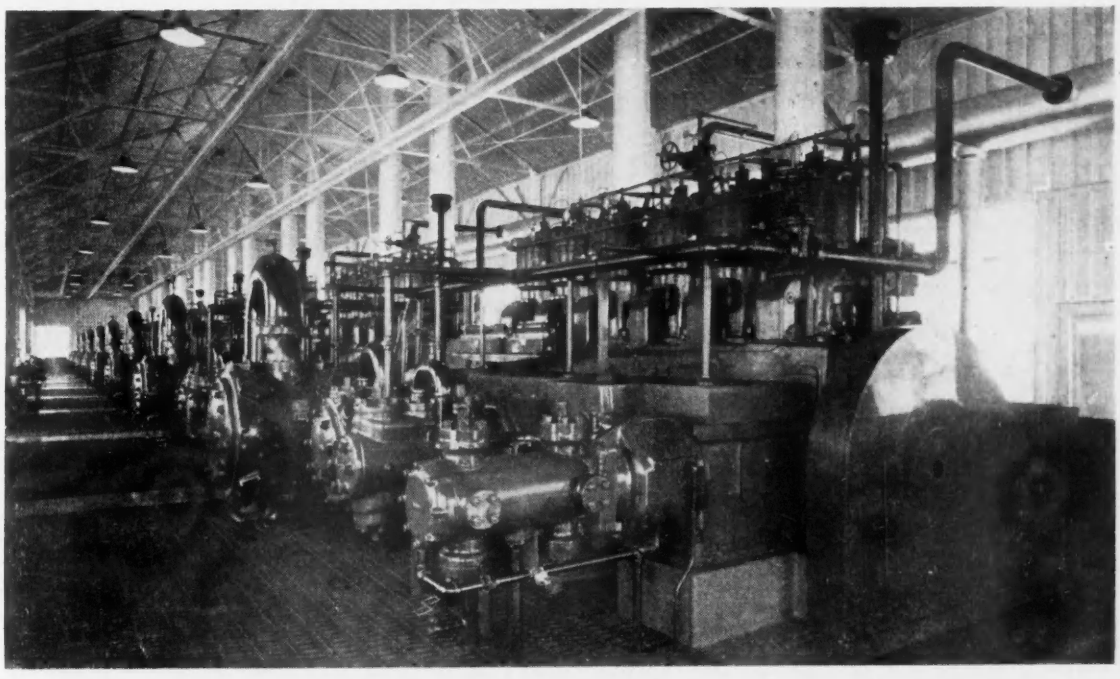
Fractionation System

The plant has a conventional absorption and steam distillation system, but a two-column fractionation system was installed to produce casinghead gasoline and liquefied petroleum products. The absorber operates at 500 pounds. The process equipment has a rated capacity of 15 million cubic feet per day at that pressure. The field gas-gathering facilities were converted to a vacuum system, and all connected separators were elevated to permit separation at atmospheric pressure. The average 20-pound gasoline recovery from the incoming gas is about 1.50 gallons per thousand. At the present time the Rincon plant is processing about 12 million cubic feet of gas per day.

Installation of gasoline recovery equipment and the change to a vacuum gathering system required an additional compression stage and recyclindering of the old compressors. In the revised plant three compression stages are employed in compressing the gas to the 500-pound process pressure, while a fourth stage compresses the gas, leaving the absorber to the required injection pressure. The first, second, and third-stage compressor cylinders in the present plant have a rated capacity of 13,000 Mcf per day from ten inches of vacuum to 500 pounds. Because of shrinkage losses and withdrawal of plant fuel from gas leaving the absorber, the fourth-stage compressor cylinders were designed to handle 11.5 million cubic feet per day at a discharge pressure of 2000 pounds. Actual discharge pressures have ranged from 1850 to 1950 pounds in recent months.

Gas injection into the "G" and "D" sands was inaugurated in May, 1941, when the first two compressors were placed in operation. These sands are respectively the second and third largest oil reservoirs in the field and at that time were the principal sources of production. In December, 1941, return of gas to the "I" and "K" sands was commenced; however, additional development and production tests proved the "K" sand to be considerably smaller than anticipated, and in January, 1943, the "K" sand injection was discontinued. In February, 1944, soon after the installation of the third compressor, the first gas was returned to the "E" sand.





Eight 600-horsepower compressors in the Rincon plant. Each condenses gas in four stages: first to about 25 pounds, next to 60, then to 600 and finally to 2000 pounds.

Injection into the Lower "H" sand was commenced in May, 1944.

The five sands in which gas injection operations are currently conducted account for the bulk of the field's known oil reserves. Three of these reservoirs, the "D," "E," and "G," have extensive gas caps. The North "I" reservoir had a very small gas cap, and no free gas was originally in place in the Lower "H" sand.

To date, about 10 billion cubic feet of gas, which otherwise would have been lost, have been conserved to aid in the production of more oil and for ultimate use as fuel or raw material in future manufacturing processes. This has cost the operators approximately one-half million dollars.

Only one input well has been used for each of the sands. Since suitably located gas or high-ratio wells were already available, it was unnecessary to drill special input wells. In reservoirs having free gas caps, wells located in the gas cap and at some distance from the gas-oil contact were selected for input wells. If no gas cap existed, a well located as high as possible structurally was chosen. Good sand conditions were of course required.

The effect of gas injection in the various reservoirs has been generally satisfactory. The rate of pressure decline has thus far been satisfactorily controlled in the three reservoirs having extensive gas caps. More uniform pressure distribution possibly could be procured temporarily, at least in some of the larger reservoirs, by gas injection at downdip locations in the oil zone, but the additional problem of controlling the injection gas probably would outweigh any advantage secured.

In Rincon, as in most injection programs, the most serious problem is minimization of gas channelling or bypassing. This problem has been more acute in the reservoirs without gas caps. Where gas has been injected into a large gas cap, equilization of pressure throughout the gas cap occurs and the gas expands more uniformly over the broad gas-oil interface. Thus far at Rincon, gas-oil ratio control has not been much more serious in the gas-cap reservoirs than if no injection had been practiced; however, increasing difficulty may be expected as depletion progresses. Present indications are that a critical stage is approaching in at least one of the reservoirs.

The seriousness of gas channelling depends to a large extent on the irregularity of the permeability profile. A recent workover job in the Rincon field indicates that the squeezing off of highly permeable streaks and the selective recompletion in less permeable portions of the producing zone may have some possibility as a corrective measure in those wells where suitable distribution of permeability exists.

Regulation of the location and rate of reservoir withdrawals is important in controlling gas bypassing. Practical and economic considerations limit the extent to which these controls can be effective, but a certain degree of freedom in the shutting in or curtailment of wells is essential to the success of any injection program. The Railroad Commission has gone a long way toward accomplishing this through its allowable transfer policies. Consideration of lease equities still imposes certain limitations; and while large leases give a workable degree of freedom at Rincon, complete unitization is essential for optimum results.

Gas Storage

From the standpoint of gas storage alone, successful results are being obtained only in the three reservoirs with extensive gas caps. In the other two reservoirs an average of less than 40 percent of the gas injected has been effectively stored. The remaining 60 percent has been subsequently produced, together with such gas as would normally accompany the oil withdrawn. While a somewhat greater volume of gas probably has been conserved than is indicated by these figures due to the retention of gas in solution, injection in these two zones as a gas storage project is by no means economically attractive. This is especially true when consideration is given to the fact that the percentage of gas effectively stored will become less as depletion progresses. The profitability of gas storage in the gas cap reservoirs will likewise decrease in the later stages of depletion.

At present, recovery from various reservoirs in the Rincon field subject to gas injection ranges from approximately 7 to 13 percent of the original tank oil in place. The effect of gas injection on ultimate recovery is therefore still largely a matter of conjecture. Performance of the project has thus far been generally satisfactory and there seems little doubt that a substantial increase in recovery will result.

In summarizing experience thus far obtained at Rincon, the following observations seem warranted on results to be obtained from gas injection in similar gas-drive reservoirs:

1. With proper operation and control, gas injection may be reasonably expected to increase ultimate oil recovery, particularly in reservoirs where no original gas cap is present.

2. From the standpoint of gas storage alone, more favorable results may be expected where it is possible to inject into a gas cap. Where no free gas cap is present or where dispersed injection is to be practiced, the profitability of gas storage is quite doubtful.

3. Control of injected gas is easiest in reservoirs having original gas caps and better control is possible where injection is confined to the highest portion of the reservoir. Serious control problems may be expected where dispersed injection is practiced.

4. For proper control, operating interests and land ownerships must be such that a considerable degree of operating flexibility is possible. The more completely the project approaches unit operation, the more successful the results will be.

The oil industry is acutely conscious of the issues involved in the conservation and utilization of casinghead gas. It realizes, far more than those outside the industry, that real conservation is not only necessary from the standpoint of public welfare but that it is also reflected in greater profits as a result of more oil produced and greater efficiency in operation.

Casing and Wire Rope

...A LOOK AT THE FUTURE

"A NEW World's Record*—Deepest Hole Drilled to 17,236 Feet in Caddo County, Oklahoma!"

This newspaper headline and others in the same vein have been appearing with increasing frequency in recent years. No wonder we hear, "Where will it end?" or "When will they reach 20,000 feet?" The latter question poses a near avalanche of others: What does 20,000 feet mean in terms of pressures? Will formation pressures be hydrostatic, less than one-half pound per foot of depth; or will they approach geostatic, nearly one pound per foot of depth? What stresses will these pressures produce in wire rope, in drill pipe, in well-head equipment, in casing and tubing? What safety factors will be used in designing and installing equipment and what will be required of equipment in terms of strength? What yield strength will meet the rigorous requirements? Can it be done commercially, or will it be a metallurgical laboratory curiosity?

Let's take these up, one by one, and see where they lead us.

Well Depths

Search of THE OIL WEEKLY files reveals the steady grinding of drilling bits deeper and deeper into the earth in quest of oil... oil which once was only a hawker's panacea, then found a real place in man's life when it lengthened the day and made possible work and recreation in the hours which formerly were black. And today it performs so many chores for man, so many miracles of light and heat and speed, that no one can conceive of being without it—even if that means digging 20,000 feet straight down to get it. Table 1 is a list of the world's drilling depth records over a 20-year period.

It will be noted that, except for a temporary lull during the war, the drill has penetrated a little deeper each year for two decades. Twenty years ago, a depth of 8000 feet was reached; 15 years ago, the magic figure of 10,000-foot depth was no longer a goal. Incidentally, both of these depth records were made by a railroad in its search for fuel oil. Eight years ago a well was drilled to 15,000 feet, and two years ago 16,000 feet was passed.

It was about ten years ago that drilling below 10,000 feet became commonplace. In 1937 alone, more than 80 wells were drilled beyond that level. All indications point to greater and greater depths of drilling.

Some interesting conclusions can be drawn from a plot of well depth records over this 20-year period. If some liberties are taken with extrapolation, arresting conjectures result. Figure 1 shows constantly increasing well depths. Extrapolation A is a continuation of the depth trend of the years 1927 to 1931, indicating that a depth of 20,000 feet would be reached by about 1941. Little increase in depth occurred during the depression years, but from 1935 to 1938 the former trend was resumed and Extrapolation B reaches 20,000 feet by 1943. However, the war years of 1939 to 1943 were not favorable for depth records and consequently the trend was reversed. But in 1944, 1945, and 1946, the progress of drilling records had again been resumed, and Extrapolation C indicates 20,000 feet by 1951 or thereabouts. At any rate, whether or not this analysis and its conclusions are exactly borne out in the years ahead, or whether some other rate will hold, one thing is sure—we had better be ready soon!

TABLE 1
Well Depths—1927 Through 1946

Year	Depth-Ft.	Location	Compnay
1927	8046	Olinda, California	C. C. M. O.
1928	8523	Big Lake, Texas	Texon O. & G.
1929	9280	Long Beach, Calif.	Shell
1930	9753	Midway, California	Std. of Calif.
1931	10030	Ventura, Calif.	C. C. M. O.
1931	10585	Vera Cruz, Mexico	Penn-Mex.
1933	10944	Kettleman Hills,, California	Union Oil
1934	11377	Balridge, Calif.	General Pet.
1935	12786	Upton Co., Texas	Gulf
1936	12200*	Vermilion Parish, La.	Continental
1937	14020	Rio Bravo, Calif.	Superior
1938	15004	Wasco, Calif.	Continental
1939	14582*	Washita Co., Okla	Continental
1940	13610*	Cameron Parish, La.	Superior
1941	11427*	Texas Gulf Coast	
1942	12952*	Claiborne Parish, La.	Union Prod.
1943	12843*	Lincoln Co., Miss.	California Co.
1944	15279	Pecos Co., Texas	Phillips
1944	16246	So. Coles Levee, California	Std. of Calif.
1945	16655	Brazos Co., Texas	Phillips
1946	15732*	Forrest Co., Miss.	Superior
1946	15465*	Caddo Co., Okla.	Superior
1946	16668	Kern Co., Calif.	Pacific Western

* Not a record—included for general information.

Expected Pressures at 20,000 Feet

Let us take a look at 20,000 feet and calculate the pressures which may be expected in the fluids in the porous formations which must be there if oil is to be found. The pressure exerted by a hydrostatic head of 20,000 feet of water would be about 8800 pounds per square inch. However, pressures today approach this figure in some cases at only 10,000 or 12,000 feet. The pressure of salt water of the commonly used density of 9.6 pounds per gallon is 10,000 pounds per square inch, and if the collapsing pressure were caused by a fluid equivalent to a heavy mud weight of, say, 12 pounds per gallon, a pressure of 12,500 pounds per square inch would be encountered. If, for purposes of comparison, it were desired to consider the pressure as caused by the weight of the earth itself, assuming an average density of 19 pounds per gallon, and assuming that it could be fluid enough to transmit pressure from the surface to 20,000 feet, it could amount to as much as 20,000 pounds per square inch. However, the selection of neither extreme can be justified. In the light of the experience of today's wells, it would seem that a conservative assumption would be to select the pressure that would result from 12 pounds per gallon drilling mud, or 12,500 pounds per square inch as the arbitrary figure which materials and equipment must be designed to resist.

Expected Collapse Stresses In Tubular Materials

This discussion will deal largely with casing, as it is not likely that tubing or drill pipe will require a separate solution. The latter two materials are usually of smaller diameter than casing, hence do not present the same difficulties in design which the larger, more "slender," hence more unstable, cross-section of casing presents.

A further reason for concentrating attention on the solution of the casing problem lies in the fact that the maxi-

*Superior Oil Company of California's Weller 51-11 in Caddo County, Okla., which had reached a total depth of 17,236 feet on March 14, 1947.

By HERBERT M. COOLEY

Bethlehem Steel Company,
Tulsa

mum stresses in wire rope will depend upon the weight of the casing selected for this depth. However, the weight is limited automatically because advantage cannot be taken, in casing string design, of the simple expedient of increasing cross-section to increase collapse resistance, as a point is soon reached where the greater weight of the string can no longer be supported by the top section. Therefore it is clear already that higher physical properties necessarily will play an important part. On the other hand, there is a limiting resistance to collapse for each size and weight of casing beyond which further increase in yield strength will not result in increase in collapse resistance. It seems, therefore, that a proper approach to the problem will be to select the smallest size commonly used for oil strings, 5½-inch outside diameter, and the heaviest weight per foot now in common use, 23 pounds, and then try to arrive at an estimate of the stresses which will result from a fluid pressure of 12,500 pounds per square inch.

The API formula (Code 5-C-2) for calculating fiber stress from external (collapsing) pressure is:

$$S = \frac{P \times (D/t)^2}{2\,(D/t - 1)} = \frac{12{,}500 \times 13.25^2}{2 \times 12.25}$$

= 89,500 pounds per square inch.

This figure is fiber stress, and, in the case of collapse, might be considered as approximately the value of the yield strength of casing at the point of collapse failure. There is no safety factor included in the figures so far.

Collapse Safety Factor Considerations

If 12-pound per gallon mud is used to offset the fluid pressure, as we have assumed, a hydrostatic pressure of 12,500 pounds per square inch and a fiber stress of 89,500 pounds per square inch result. According to present or "conventional" methods used on casing for wells of present depths and on present materials, the following series of steps, which really amounts to a series of safety factors, is applied. First a safety factor of 1.33 is applied when the figure of 75 percent is applied to the average collapsing pressure resistance to reduce it to an arbitrary "minimum." Then an additional safety factor of 1.125 is applied in conventional practices, with the following resulting average yield strength in the case under discussion:

89,500 × 1.33 × 1.125 = 134,000 psi.

Some might consider this to be the end of the road for several reasons, not the least of which might be the metallurgical problems which would be expected to attend the rolling and finishing and running of a material having the cross-sectional properties of casing and an average yield strength of 134,000 psi. Let us now develop a series of reasonings, most of which are being practiced or being given consideration under various conditions encountered in oilfield practice:

1. The standard or conventional method, as discussed in the foregoing, results in a collapse safety factor of 1.33×1.125 or 1.50, which when applied to the critical yield strength gives an average figure which will be aimed for in metallurgical design. This is the figure used by most oil company engineers for normal, or average conditions.

2. Some of the more conservative operators use a 1.25 safety factor after applying the 1.33, or a combined figure of 1.67.

3. At least one operator, as a result of experiences which indicated the desirability therefor, applies a second 1.33 factor, for a total collapse safety factor of 1.78.

4. A small group of oil companies operates on a somewhat different basis, applying a 1.35 safety factor after first using a 1.11 minumum factor, for an overall safety factor of 1.50. This is simply the use of 90 percent of the average collapsing pressure and applying a higher safety factor to reach the same end point as the "conventional" method already discussed.

5. Others apply a 1.25 safety factor over the 1.11, making a total of 1.39.

6. Still others use the "standard" 1.125, which when combined with 1.11 gives the low overall factor of 1.25.

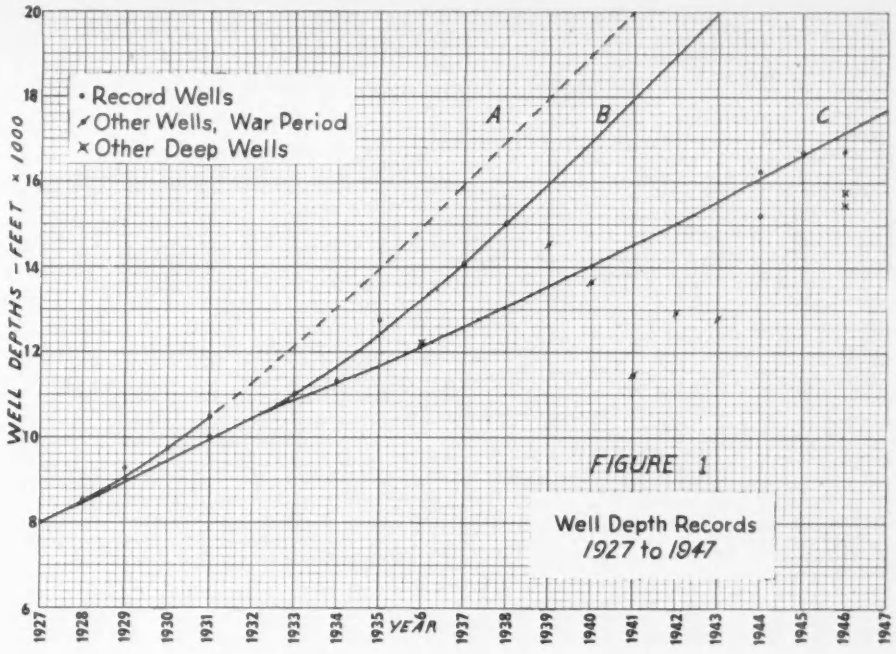
7. Several operators, in designing for collapse pressure for very deep wells, beyond 12,000 or 14,000 feet in depth, recognize the fact that collapsing stresses resulting from external pressure will always, in the lower part of the strings, be offset largely by opposing internal pressure resulting from fluid pressures, and that there is now no known way of reducing or eliminating the internal pressure no matter how desirable economically it might be. One operator under these conditions uses a figure of 85 percent of the 1.33 factor, or 1.13.

8. Several companies in designing for very deep wells have set up an arbitrary figure of 1.125 for the overall safety factor for wells deeper than 14,000 feet, and there is reason to believe that a factor of this magnitude may find wide acceptance for such wells.

Now let us see what these various factors, all of which are in more or less common use today for widely varying conditions, mean in terms of our 89,500 psi stress at 12,500 psi pressure.

Number	Safety Factor (Collapse)	Average Yield Strength (psi)
1	1.78	159,000
2	1.67	148,000
3	1.50	134,000
4	1.39	123,000
5	1.25	110,000
6	1.13	101,000
7	1.125	100.000
8	1.00	89,500

There is reason to believe that future thinking may crystallize around the reasoning of Nos. 7 and 8, above, and that 1.125 or thereabouts may be widely accepted as a proper safety factor for depths from 15,000 to 20,000 feet. If this possibility becomes a realized consensus, then a steel with an average



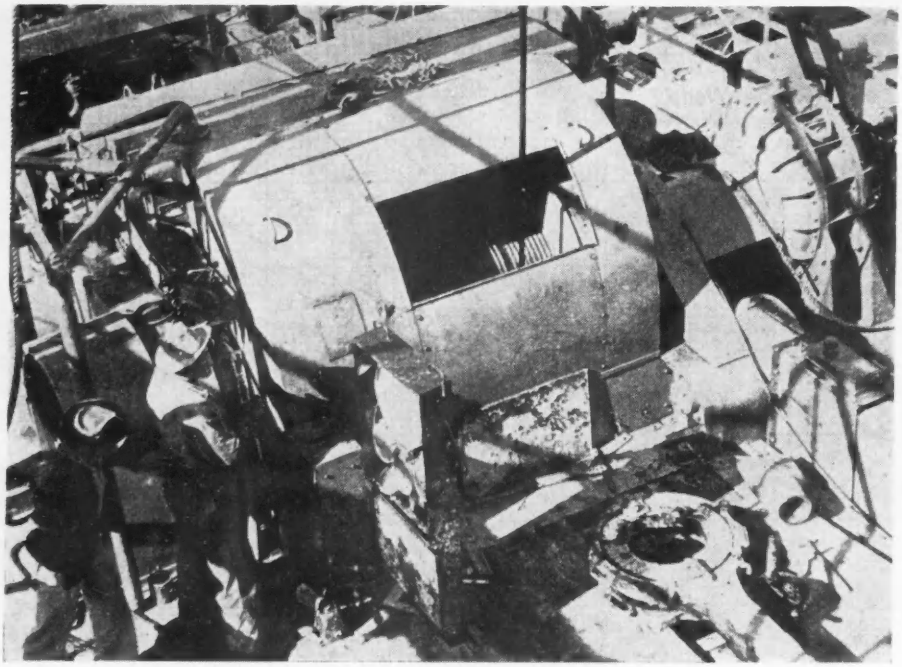


Figure 2. Large drawworks used in deep well drilling.

yield strength of around 100,000 psi, or say, not over 110,000 psi is indicated. It is intriguing to consider the possibility that, at depths of 15,000 to 20,000 feet the lowering of actual collapsing pressure due to internal heads will be found to be sizable and dependable, and a safety factor as low as 1.00 may be used, and the calculated average yield strength under such a condition becomes around 90,000 psi and casing being made today can be considered practically adequate.

Tension Stresses and Safety Factors in Casing

The casing for these deep wells must be strong enough to resist tension failure. In other words, the top section must be strong enough to support the entire weight of the casing string which is suspended thereon. Since upsetting or heat treating or other methods can be used to produce joints which are at least as strong as the body of the pipe, it is necessary only to determine the strength of steel required to hold its own weight, in accordance with custom and on the side of safety, neglecting the effect of buoyancy of the mud or other fluid through which the casing is run. A simple and understandable method of arriving at this figure is to consider the weight of a cubic inch of steel, 0.2833 pounds. A one-foot length of this cross-section would weigh 3.3996 pounds and 20,000 feet would weigh 68,000 pounds. In other words, a steel of 68,000 psi minimum yield strength would not fail if 20,000 feet of it were suspended from a fixed support at the top. With a 1.6 safety factor this figure becomes 109,000; with 1.5 it is 102,000 and with 1.4, it becomes 95,000 psi. With a well-designed strong joint and the virtual elimination of many of the variables of regular threaded and coupled casing, not to mention the possibility of floating the casing during running and placing some reliance on the buoyancy of the fluid through which it is run, there seems to be no good reason to believe that a safety factor much above 1.4 will be required, hence a steel of around 100,000 psi average yield strength is indicated. A further means of increasing the tension safety factor without requiring the use of higher strength steel is the present method of using casing of lighter weight in the middle of the strings where neither the maximum collapsing nor the maximum tension stresses are encountered. There is every reason to expect the use of a considerable amount of at least 20-pound, if not 17-pound, casing in the middle of the longest strings of 5½-inch outside diameter casing.

Internal Pressure Stresses and Safety Factors

The application of bottom-hole pressures to the internal pressure resistance of casing has until recent years received little consideration. Today, there is a wide divergence in the opinions of field people as to just how to apply what is known about internal pressure. In an earlier discussion in this article, it was indicated that a pressure of 12,500 psi would be used in these calculations. The API formula for calculating fiber stress for internal pressure for 5½-inch OD 23-pound casing is

$$S = \frac{P \times D}{2 \times t} = \frac{12{,}500 \times 5.5}{2 \times .415} = 82{,}800 \text{ psi.}$$

The question of safety factor for internal pressure resistance has received less consideration and consequently has less experimental or trial and error basis than for external pressure. Using the .875 figure (1.14 safety factor) which appears, in the API code calculations, the average yield indicated is 94,600 psi. A number of operators apply this figure without additional safety factor defending their position on the basis that practically all expected service conditions have been considered and that actually internal pressures encountered in casing will be negligible in most cases. There will be an external fluid pressure largely neutralizing the internal pressure except at the top of casing strings, and even at the top the internal pressure will be reduced by the head of fluid, whether oil or gas, which will be inside the casing. However, a slight additional safety factor of about 1.05 can be applied without raising the average yield strength over 100,000 psi and with a 1.16 additional safety factor, the yield becomes 110,000 psi.

Loads and Stresses In Wire Rope

The biggest jobs wire rope will be called upon to perform will be to carry the drill pipe load during the drilling operation and later the casing load during the casing running operation. The latter can be roughly estimated on the basis of 20,000 feet at 23 pounds per foot, or 230 tons. Drill pipe strings probably would be lighter, undoubtedly following the practice of easing the load by tapering the strings. Already two-section strings have been successfully operated at depths of 16,000 feet, with a larger diameter in the upper section to carry the heavier load. There is reason to believe that loads much heavier than 230 tons can be handled by wire rope.

Loads of the magnitude of 400 tons for casing and 200 tons for drill pipe, which probably would cover a 20,000-foot string of 7-inch OD casing or 12,000 to 14,000 feet of 9⅝-inch, undoubtedly can be handled with intelligent design of hoisting equipment; that is, the drum, crown sheaves and block.

From the standpoint of economy, as well as the stress magnitude, much will depend upon the size of the drum used; the line likely will be reeved in 12 to 14 parts; drums will of necessity have to be larger relatively than presently utilized, likely 24 times the rope diameter as a minimum when winding three layers of rope on the drum. Consideration is being given to spirally grooved drums large enough in diameter to wind the rope in one layer on same. There also has been consideration given to a double drum installation in which a 12-part

rope reeving would be in effect two 6-part lines with the higher efficiency and rope operating speed of the 6-part line as compared with a 12-part line.

Crown-block sheaves should have a minimum tread diameter of 36 times the rope diameter and the factor of safety on the rotary line should be not less than three and preferably 3½ on the drum line stresses and not on static loadings.

Dimensions and Properties of Wire Rope

In arriving at an idea of what can be done when rope is required for drilling 20,000-foot oil wells, consider how the wire rope has met successfully many other challenges to its ingenuity, among which are:

Hoist lines on 35-yard bucket shovels, using ropes as large as 2⅜-inch diameter.

Boom guys of 4-inch diameter wire rope on huge shovels, replacing eyebars.

Draglines on 25-yard bucket excavators, using ropes as large as 3⅛-inch diameter.

Shaft hoist ropes in metal mines, in one lift in shafts 6000 feet deep.

Shaft hoist ropes in coal mines, operating at speeds of approximately 50 miles per hour.

Incline haulage ropes 2¾-inch diameter, one mile long, hauling loaded freight cars up the incline.

Vertical lift bridges on which the moving span hoisted vertically weighs approximately 2000 tons, using wire ropes as large as 2⅜-inch diameter.

Cable tool drilling lines, used in drilling to depths in excess of 10,000 feet.

Considering these achievements, undoubtedly a safe and satisfactory rotary line can be furnished for 20,000 feet. Already there is a considerable background of experience in drilling holes 15,000 to 16,000 feet deep. The rotary line probably will be 1½-inch or 1⅝-inch diameter and tough, "gutty" wire for these lines can be specially drawn to meet the requisites for 20,000-foot drilling.

Dimensions and Properties of Tubular Goods

Drill pipe problems in drilling 20,000-foot oil wells probably will require a different solution from that required for casing and tubing. The present success with API Grades D and E of 55,000 and 75,000 psi minimum yield strength, respectively, in drilling wells of 15,000 and 16,000 feet indicates the desirability of continuing the use of these steels if at all possible. Some of the quenching and drawing operations which might be required to produce higher yield strengths with good fatigue and impact properties might not be adaptable to drill pipe. There is some possibility that air quenching and drawing methods may be developed, but whether properties equivalent to liquid quenching can be developed is not yet indicated. Some development of induction heating and liquid quenching may be a possibility. However, the simplest and most promising solution may lie in the tapered string with a larger diameter in the upper portion, as mentioned under Wire Rope Loads. A pipe string in use in the Pacific Western well in Kern County, California, is reported as follows:

6,000 feet 4½-inch OD—top section
10,668 feet 3½-inch OD—bottom section.
16,668 feet total.

The ability of the present grades to withstand handling methods such as fast running in and out of the hole, high rotating speeds, wobbling in cavities and in crooked holes, and cutting of the pipe by tongs, elevators and rotary table slip teeth indicates that every effort should be made to provide tapered or other designs which will include as much as possible if not all of these grades.

The development of casing and tubing possessing the proper physical strength for good performance in deep wells will present an interesting problem. There is a wealth of experience and information in the utilization of both carbon and alloy steels, including the emergency triple alloy steels which proved so useful during the recent World War. Quenched and drawn carbon steels, although providing high yield strength, may not provide other properties required in casing, and may present too many manufacturing difficulties. For example, a yield of about 95,000 psi may be obtained from SAE-1040 steel that has been properly heat-treated by quenching and drawing. However, the quenching medium required to obtain such a high yield strength would of necessity be either oil or water, and such practice does not well lend itself to tubular lengths of 30 and 40 feet. The same difficulty would be encountered in attempting to liquid quench and draw casing made of medium manganese or other alloy steels. However, it has been demonstrated that for casing particularly, and to some extent the same reasoning holds for tubing, it is necessary to look toward higher properties, particularly yield strength, than those currently listed by the API tables. Air quenching already is being applied to tubular products with execellent results. However, air quenching of plain carbon steels will not produce sufficiently high yield strengths to serve our purpose for casing in these very deep wells. SAE 1040 steel barely reaches 60,000 psi, and 0.33 carbon, 1.20 manganese steel produces little over 60,000 psi. While it is thus obvious that the solution of this problem cannot be readily answered with ordinary common steels and the conventional manufacturing practices it is well within the realm of possibility that yield strengths in the neighborhood of 100,000 psi can be obtained by introducing new methods and new materials. It is believed that high yield strengths in both tension and compression and in both the circumferential and longitudinal directions can be obtained from several of the well known types of steels properly processed with this specific application in mind.

The foregoing approach to determining the physical properties needed is purposely general in character. Before specific steels and heat treatments and manufacturing processes are selected, or even suggested, a large amount of metallurgical and physical design studies must be carried on in great detail. The foregoing is intended only to suggest the first steps in planning these studies. We may be sure that the challenge to provide adequate wire rope and tubular products so that oil wells can be drilled, without too much trouble and too much cost, to 18,000 or 20,000 feet, or even deeper will be met.

About the Author

HERBERT M. COOLEY of Tulsa is assistant metallurgical engineer on the staff of the operating vice president of Bethlehem Steel Company. His responsibilities are largely concerned with technical matters of interest to oil men. He has resided in Tulsa for about 12 years, going there from McKeesport, Penn., where he was chief inspector of National Tube Company's seamless and rolling mills. He obtained a degree of Bachelor of Science in Metallurgical Engineering from the Carnegie Institute of Technology and afterwards put in several years of graduate work on alloy steels. Cooley served two years as secretary-treasurer of the AIME and was assistant to L. H. Winkler, who represented his company on the Pipe Manufacturers Sub-Committee of the API. He is president of the Engineers Club of Tulsa and last year was secretary-treasurer of the Tulsa Chapter of Nomads.

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Conventional Fuels And ATOMIC ENERGY

By DR. E. R. GILLILAND
Massachusetts Institute of Technology

THE development of atomic energy has raised questions relative to the future of the conventional fuels with which we are familiar. The value of fuels such as wood, coal, oil and natural gas is chiefly due to the fact that it is possible to produce heat from them. This heat can be used for the production of power, for carrying out industrial operations, and for industrial and domestic use. To the list of the older conventional fuels, there has now been added atomic energy. Although this new source of power will not completely displace old fuels, it is certain to reduce man's dependence on them.

In evaluating the merits of atomic energy as compared with the conventional fuels, the two most important considerations are the engineering practicability and the economic feasibility. In order to analyze these two factors, it is desirable to review the technical considerations involved in the production of atomic energy.

In the light of modern scientific discoveries, the evidence is becoming very conclusive that all energy production is based on the conversion of mass and that the Einstein relationship gives the proper mathematical evaluation. Thus, in the combustion of coal, oil and gas, mass is turned into heat, but less than three parts out of 10 billion are turned into heat and thus the energy production is relatively small.

In the case of atomic reactions, there is the possibility of converting relatively large amounts of mass into energy. There are large numbers of such reactions, but this discussion will be limited to the decomposition of uranium for which the conversion of mass into energy has been demonstrated on a large engineering scale. Several of the other possible atomic power reactions have been demonstrated in the laboratory, but have not been carried to large scale application and therefore will not be considered.

In the case of uranium "235," the large-scale operations have indicated conversion of approximately one-tenth of 1 percent of the mass into energy. Thus, one pound of uranium when decomposed gives approximately 3 million times as much heat as would be produced by burning one pound of coal.

In order to utilize energy industrially, it is necessary to liberate the heat in a self-sustaining controlled reaction. For conventional fuels, this process is generally effected by combustion with the oxygen of the atmosphere. For the case of uranium, the self-sustaining heat-liberating reaction has been carried out at Hanford, Wash.; Oak Ridge, Tenn.; and Argonne, Ill., as part of the Government Atomic Energy project. These nuclear power units have ranged from very small sizes producing heat equivalent to a few British thermal units per hour up to a size that made a significant increase in the temperature of the Columbia River. Thus, the production of heat has been demonstrated for very small to very large units.

In the decomposition of one pound of uranium, the heat produced is approximately 36 billion Btu's. One gallon of gasoline on complete combustion gives approximately 120,000 Btu's, one pound of coal approximately 12,000 Btu's, and 1000 cubic feet of natural gas approximately 1 million Btu's. Thus, the decomposition of one pound of uranium produces heat equivalent to 300,000 gallons of gasoline, 3 million pounds of coal, or 36 million cubic feet of natural gas.

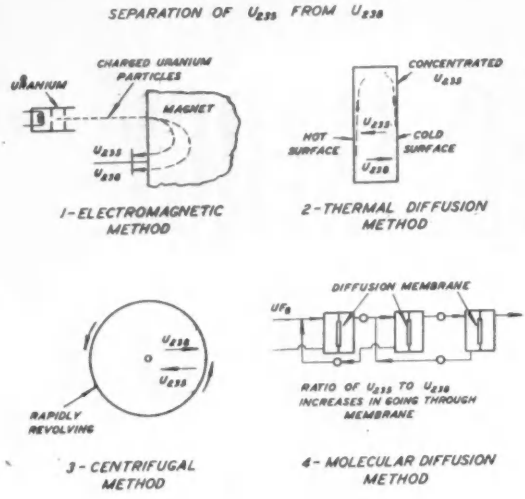
A. Engineering Practicability

In the decomposition of uranium very high velocity particles and high energy radiations are produced. It is probable that any other highly concentrated production of energy by other types of nuclear reactions also will be accompanied by similar particles and radiations. While the utilization of the kinetic energy of these high velocity particles is a possibility for power production from an engineering viewpoint, it appears much more practical to utilize the energy liberated by the reaction as heat with the conventional prime movers. Thus, the heat can be used for the production of steam which can be utilized in steam turbines or steam engines. Alternatively, the heat could be used to heat air or other gases to be used in a gas turbine. The most practical method of using atomic power in the near future appears to be the production of heat which then would be utilized with the conventional type of power plant.

The production of heat by the nuclear reaction has been demonstrated and the utilization of heat for the production of power is the present-day method, but there are engineering problems in tying the two together. These problems can be summarized as:

1. The temperature level at which the heat is produced.
2. Corrosion.
3. Radiation effects.
4. Reworking of uranium.

In the production of heat for power utilization, it is desirable to have a temperature of 500 to 1500° F. In the uranium reaction, two cases have been demonstrated on a large scale. First, the pile operation in which the temperatures so far have been limited to below 200° F, and second, the atomic bomb which produced temperatures estimated to be over 1 million° F. For power production, it would be desirable to have intermediate temperatures. So far, water and air have been used as the cooling medium and since the purpose of these units was not power production, the temperatures have been low. From an engineering viewpoint, there does not appear to be any unsolvable problem in employing higher temperatures either by utilizing water under pressure or by using some other higher boiling fluid for the coolant which then could be used to boil water or heat air in a separate operation. The newspapers recently announced that the government project scientists and engineers



Figures 1-4. Schematic diagram for the separation of U_{235} from U_{238}.

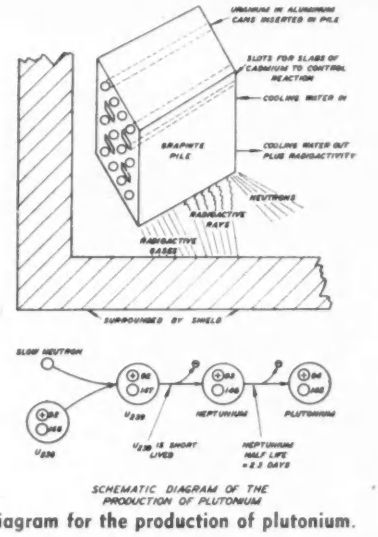


Figure 5. Schematic diagram for the production of plutonium.

have completed their design of a high temperature reactor for power production and that construction is to begin in the near future.

There are corrosion problems peculiar to the atomic power operations. These result from the fact that to obtain the most efficient operation, it is desirable to avoid using some of the most common corrosion-resistant metals of construction. In addition, the physical properties of the metals within the atomic furnace may be altered by the bombardment of the high velocity particles. As a result of these two conditions, the corrosion problems will be more difficult than in a present-day power plant.

One of the most serious problems related to the use of any concentrated reaction of the nuclear type is the fact that extremely high velocity particles as well as high energy radiations are produced. These particles and radiations are hazardous for plant and animal life and therefore must be absorbed or reflected to prevent contact with such life. To date, the most practical method of stopping such radiation is by the use of a layer of concrete from three to eight feet in thickness. With such a shield between the reaction and the operators, these hazards can be reduced to safe levels. The use of such shield limits the use of atomic power to heavy installations such as would be feasible for stationary power plants or large ships. Unless much lighter and less bulky methods of shielding are developed, atomic power as now known does not appear to be suitable for mobile power plants such as for automobiles and airplanes. At the present time, the size and weight of the shielding required makes atomic energy non-competitive with gasoline.

Another problem relating to uranium pile operation is the fact that the decomposition of the uranium produces elements which tend to interfere with the reaction, and therefore the material must be reworked periodically to remove these impurities. These impurities are very radioactive and their separation involves expensive processes requiring special chemical plants.

B. Economic Feasibility

Availability of Fissionable Material. A major consideration in the use of atomic power is the availability of the necessary materials for decomposition. Brason and Tarr[1] state that the earth's crust is estimated to contain 0.008 percent uranium by weight. From the analysis of igneous rocks, these authors indicate that this composition is probably representative down to a depth of 30 miles. The amount of uranium this represents is tremendous, but instead of quoting the billions of billions of tons of material in the earth's crust for a depth of 30 miles, it probably would be more instructive to give the comparable percentages for some of the more common metals. For example, the following table (from Brason and Tarr) lists a few of these:

Metal	Percent of Earth's Crust
Copper	0.01
Uranium	0.008
Zinc	0.004
Lead	0.002
Cobalt	0.001
Silver	0.0000004
Gold	0.0000001
Platinum	0.00000008

Thus, it will be noted that uranium is almost as plentiful as copper, is twice as plentiful as zinc and four times as plentiful as lead. When one considers the enormous quantities of copper, zinc and lead that are being used, and that have been used, it is apparent that the quantities of uranium are very great.

Beside the total availability, it is also desirable to consider the concentrations of the material. The value of 0.008 percent for uranium corresponds to an average of 0.16 pounds per ton of the earth's crust, or about two Troy ounces per ton. Since the distribution of uranium is not uniform, there are large deposits in many countries which have concentrations three to four times this great. Six to eight ounces per ton may not sound very large, but it should be remembered that it is found economical to recover gold when the concentration is only one ounce per ton.

However, the availability of natural uranium does not give the real picture, since about 99.3 percent is the uranium 238 isotope and only about 0.7 percent is the uranium 235 isotope. The latter is the one desired. In this dilute condition, the decomposition of the uranium 235 is not self-sustaining unless a very large unit containing many tons of uranium is employed. It is therefore desirable to purify and concentrate uranium 235 to produce a suitable reaction for power generation. This concentration is very difficult. Uranium 235 and 238 are essentially identical in chemical properties, as would be expected in view of the same outer electron structure. In fact, they are extremely similar in all properties, and the only real variation is in their mass. In other words, one atom has the weight of 238 and the other a weight of 235. Concentration is difficult and expensive but at least four methods have been developed: (1) electro-magnetic method; (2) thermal diffusion method;

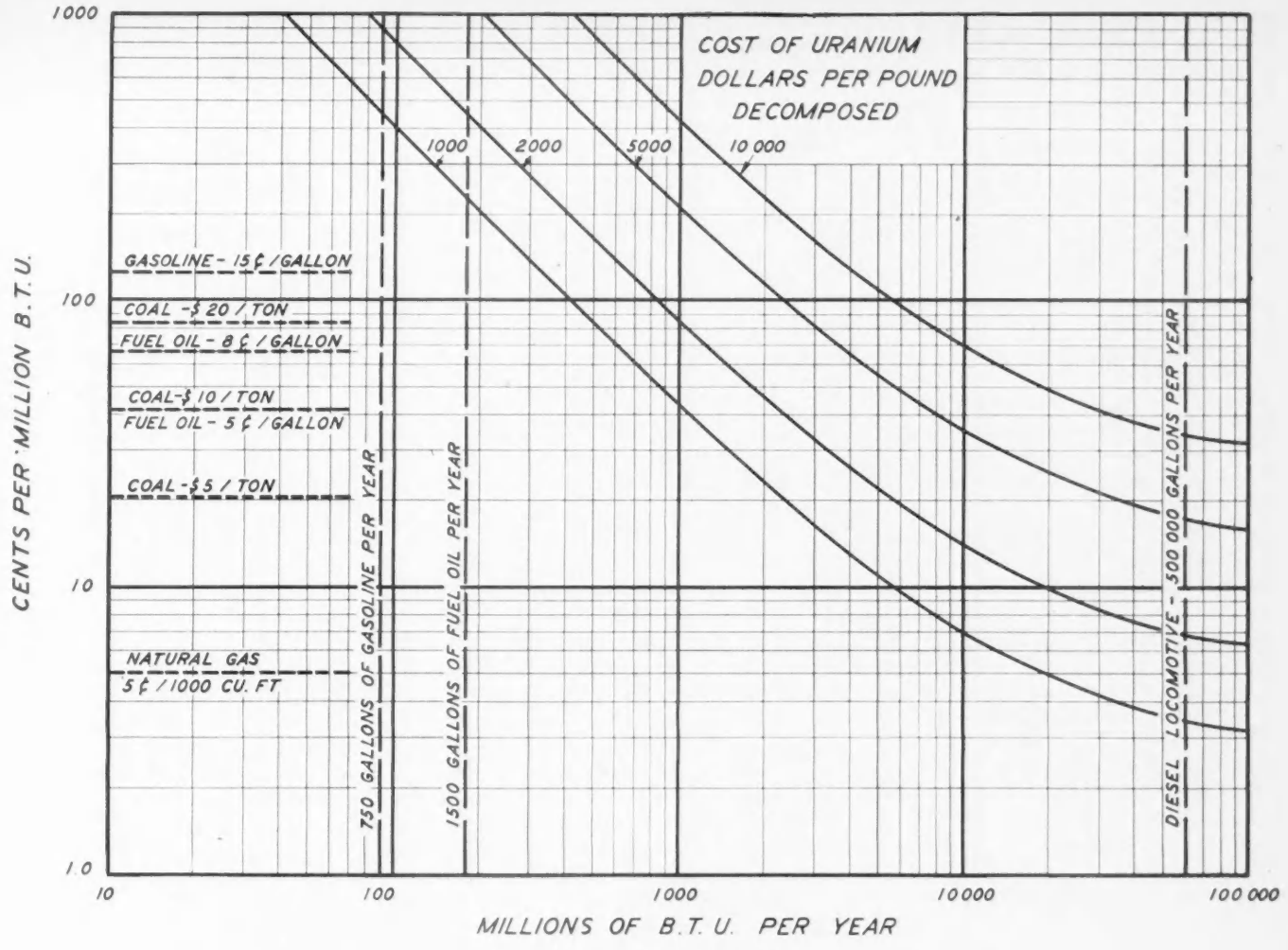


Figure 6. Comparison of fuel costs.

(3) the centrifugal method; and (4) diffusion method.

Electro-Magnetic Method

It has long been known that a charged particle moving in a uniform magnetic field follows a curved path, due to the forces involved. This method has been used in the mass spectograph which separates atoms according to their weight, and is therefore used for analytical and identification purposes. The curvature of the path results from the electrical forces produced by the movement of the charged particle and the inertia of the particle. Thus, if two particles with the same charge enter with the same velocity, but have different masses, the force of the magnetic field will bend the lighter particles more than the heavier, thereby separating them. This method was applied to the separation of uranium 235 and 238, and the Smythe report indicates that it was responsible for a major portion of the earlier production of uranium 235. Figure 1 gives a schematic diagram of the method. It is an expensive method since the efficiency of producing charged particles is very low and the whole apparatus is extremely costly to build and operate for the small amount of material that it separates. It does not appear likely that this will be one of the practical methods of separating uranium when and if this material becomes a source of industrial power.

Thermal-Diffusion Method

It has been known for at least 20 years that, if a mixture of gases of different molecular weights were placed in a vessel in which a temperature gradient existed, the lighter molecules would tend to concentrate in the warmer zone and the heavier molecules in the colder zone. Thus, if uranium hexafluoride vapor is placed between an inner and outer tube and the inner tube heated, and the outer tube cooled, the uranium 235 will tend to proceed to the center and uranium 238 to the outside. As a result of the difference of mass, the vapor in the center will rise and at the outside it will fall. Thus, the lighter 235 will be concentrated in the upper portion of the tube and the 238 in the lower portion of the tube. The concentration obtained per unit is small and the heat consumption is extremely high. The tremendous quantities of heat required make the thermal diffusion method appear uneconomical, but if cheap atomic heat were used, it might be feasible. A schematic diagram of the method is given in Figure 2.

Centrifugal Method

The usual principles of centrifuging can be applied to uranium hexaflouride gas (Figure 3). However, since the difference in mass of the two molecules is so small, the effective concentration is very low and a large number of stages is required. The difference between 235 and 238 sounds large, but it should be pointed out that oxygen and nitrogen differ in weight by a percentage ten times as great and the only successful methods developed for their separation depend either on their difference in chemical reactivity or the difference of vapor pressure of their liquids.

Molecular Diffusion Method

If a mixture of gases is allowed to pass through very small openings, it is found that the lighter molecules, having a higher velocity, pass through in a greater proportion than they are present in the mixture. This difference is not very great and the concentration ratio is proportional to the square root of the ratio of the molecular weights. In this case, the ratio of the molecular weights is 1.013 making the separation factor

1.006. It is obvious that a very large number of stages is required to give any effective separation, (Figure 4). In spite of the large number of stages required by the molecular diffusion method, this appears to be the most promising.

New Elements—Plutonium

There is another promising source of materials for fission, the synthesized element, plutonium. During the war, it was found possible to convert uranium 238 into plutonium. This latter material is a new element whose fission properties are very similar to those of uranium 235. It will react under similar conditions liberating energy comparable to that obtained with uranium 235.

Plutonium is made in the so-called pile. These nuclear reactors are operated such that the decomposition of the uranium 235 starts a chain reaction that converts a small fraction of the uranium 238 to plutonium. These units could be used for power production, but they are large in size and would be adaptable only to stationary power plants. After a small fraction of the uranium 238 is converted to plutonium, the reaction dies out due to impurities produced, and it is necessary to reprocess the metal to remove the impurities and to obtain plutonium. Figure 5 is a schematic diagram of a nuclear reactor.

It is found that uranium and plutonium can be separated chemically, but the process involved is difficult, though still easier than separating uranium 235 and uranium 238. Only a small portion of uranium has been converted to plutonium, the whole material is extremely radioactive and therefore hard to handle, and the entire operation must be carried out automatically behind heavy shields. After the impurities have been removed, the uranium 235, uranium 238 and plutonium can be reused in the pile. If concentrated fissionable material is desired, the plutonium can be separated chemically. For the production of power or concentrated fissionable material, this method appears to be the most promising.

This pile type of operation offers the most immediate promise of atomic energy. In other words, the uranium 235 and uranium 238 which are decomposed in a self-sustaining operation, produce large quantities of heat. The size of the pile necessary for a self-sustaining reaction depends on the concentration of the uranium 235 and uranium 238 and in the dilute state an industrial size pile would be large, containing several hundred tons of uranium. It is believed that safe operation could be obtained with concentrated material in piles not over two feet in diameter.

In evaluating costs, two main classifications are involved, i. e., (1) the operating costs, and (2) the investment and fixed charge. While there will be differences in the labor required, the relative costs of the various fuels should give an approximate orientation of the operating costs.

In a previous section, it was pointed out that the decomposition of one pound of uranium gave a heat production equal to 300,000 gallons of gasoline, 3 million pounds of coal or 36 million cubic feet of natural gas. The following table lists the value of one pound of uranium decomposed on a heat basis, as compared with conventional fuels:

Gasoline at 15 cents per gallon is equivalent to uranium at $45,000 a pound.

Coal at $5 per ton is equivalent to uranium at $8000 a pound.

Natural gas at 10 cents per 1000 cubic feet is equivalent to uranium at $4000 a pound.

While the cost of the heat alone is not a fair comparison, it does indicate the relative range and after allowing for the new problems associated with atomic energy, it is probable that the cost per pound of the uranium decomposed would have to be somewhere in the range of $10,000 to $20,000 to compete with petroleum, and from $2000 to $8000 to compete with coal and natural gas. Accurate cost data are not available on the production of the active fissionable elements, but in large installations where the cost of fuel is a major consideration, the possibility of nuclear energy being able to compete with present fuels appears to be real.

The original investment and fixed charges become a major factor in small installations such as mobile power plants and domestic heating plants. There is a minimum size below which the atomic unit will not be self-sustaining, and Smythe indicates that this is between one and 100 kilograms (2.2 to 224 pounds). Assume that a practical unit could be built with a minimum of ten pounds of active fissionable material. (The estimate of ten pounds for a self sustaining unit is probably below the actual minimum.) In a normal year, the average prewar automobile used about 750 gallons of gasoline. Thus, only 1/4000 of a pound of uranium per year would be utilized out of the ten pounds to develop the same energy. The 750 gallons of gasoline cost the consumer about 15 cents a gallon (before taxes) or a little over $110 per year. It is interesting to consider the maximum value of the ten pounds of fissionable material which at a four percent interest rate would equal $110 per year. This is only $275 per pound. Thus, if the cost of fissionable material is over $275 per pound, interest charges on the capital investment alone would make the operating costs higher for the average motorist than using gasoline. Costs as low as $275 a pound do not look probable in the foreseeable future.

Figure 6 gives a comparison of the cost of heat as cents per million Btu's as a function of yearly heat consumption for various assumed costs per pound of fissionable material consumed. In preparing this chart, a minimum of ten pounds of active material was assumed for the reactor and interest was taken at 4 percent per year. A few typical costs for petroleum products and coal are indicated on the ordinate, and three typical fuel consumptions are indicated on the abscissa. On the basis of these estimates, nuclear heat does not appear attractive for automobiles or domestic heating. It might become attractive for large installations such as diesel locomotives or industrial power plants.

In a large installation, a cost of $10,000 per pound of uranium decomposed would be equivalent to oil at about 4 cents per gallon or coal at $6.50 per ton. At the present time, the possibilities of producing synthetic oil or of mining coal at these costs appear greater than do the possibility of reducing the costs to $10,000 per pound of uranium decomposed. It is probable that these goals could be obtained for synthetic oil and coal with a research and development cost less than one-tenth of that necessary to develop nuclear power, and the reserves of coal are adequate to supply the U. S. requirements for synthetic oil and coal for more than 1000 years. There will be many new developments in nuclear energy and some of these may change the picture, but the technical, political and economical problems associated with the use of nuclear energy are of such magnitude that serious competition of this form of energy with oil and coal is not likely to be a reality for at least 20 to 50 years except for those special cases such as warships where cost is not the main consideration.

COMING SOON

SHORELINE TREND MAY DEVELOP OKLAHOMA GOLDEN HORSESHOE

By Anthony Gibbon,
Staff Writer

WATCH FOR IT IN AN EARLY ISSUE

REFERENCE

[1] Brason and Tarr, Introduction to Geology, Second Edition, 1941, McGraw-Hill Book Company, page 6.

Held on a fixture which permits rotation for work on the four cutting edges, this bit body is positioned so that the copper backing plate is level, and the new cutting edge is outlined in hard-surfacing material, approximately the chalked outline of the former bit shape. The steel matrix is then built up around the hard-surfacing pieces, forming a new blade with proper clearance and cutting edge. In the blade turned edgewise to the camera, hard-surfacing materials from a former rebuilding are plainly visible, and show how the wear is taken by the hard material, while protecting the softer matrix metal behind it. New circulation nozzle has already been welded in place, prior to the reconditioning of the cutting surfaces.

Photo courtesy Linde Tips

Rebuilding Worn Drag Bits

By ELTON STERRETT
Engineering Editor

LARGELY because of the formations in which the drag bit is effective, wear is concentrated almost entirely on the cutting and gauge edges of the bit, while the shank and circulation passages retain almost all their initial condition and are good for many more round trips.

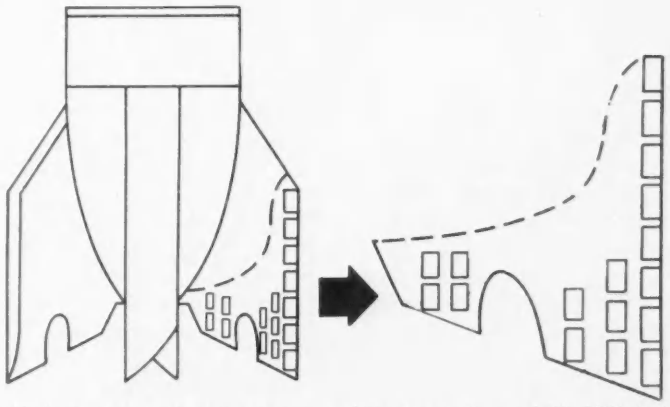
Reconditioning of drag bit cutting edges may be accomplished in two ways. One involves the cutting away of the stubs left from former cutting edges, and the welding in of new blades along the lines of the former cutting members. This method permits the spare blades to be made up in advance, and stored at the job ready for placing by the welder when the worn bit body is available. Maintenance of gauge by the bit is secured by proper spacing of the new blades and body prior to filling in with the welding bead.

The alternate method for rebuilding worn drag bits is by reshaping the blades directly on the stubs of the worn bit. A heavy copper backing plate is clamped to the bit in position where the flat surface extends the former working face of the cutting member. The former outline of the cutting edge is chalked on the copper, and hard-surfacing materials laid in on their flats until the outline is filled in as closely as possible without actually contacting the adjacent pieces of hard material. The former thickness of the blade is then built up around the hard material with high-strength alloy steel, after first having preheated the end of the job to around 600° F. to minimize shrinkage stresses across the junction between bit body and added metal.

It has been found that if the material added through the welding rod be flowed entirely around the hard-surfacing material on the copper plate, so as to surround each piece with a matrix of steel, that spalling, chipping or breaking out of the hard material is prevented, and it is retained in place until worn completely through by action of the bit against the formations being penetrated.

Following the process of building up the worn section of the bit, during which the hard-surfacing materials are satisfactorily embedded in the steel matrix, the entire surface is coated with crushed tube rod of the same hard-surfacing material, so as to present an entire face of wear-resistant material to prevent erosion of the supporting steel on the face of the cutting edge and consequent isolation of the cutting material.

The rebuilt bit may be sharpened, if the matrix has been built up to an extent where it submerges the effective cutting points of the hard-surfacing material, by grinding away the back of the builtup section to conform to the standard shape. This grinding operation does not affect the working face, which has been held to shape by the copper plate during the welding operation, and then given the added protection of the hard-facing coat applied through the tube rod of crushed material.



Typical spacing of cast tungsten carbide inserts in a rebuilt 10⅝-inch four-way drag bit. Crushed tungsten carbide tube rod is applied over and between the inserts and extending to the dotted line.
(Courtesy Linde Tips)

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UNITED STATES STEEL

SECONDARY RECOVERY IN THE

Delaware-Childers Area

By KENNETH H. JOHNSTON and C. H. RIGGS
Petroleum Engineers, U. S. Bureau of Mines, Bartlesville, Okla.

APPLICATION of modern secondary-recovery methods in the eastern part of the Delaware-Childers field, Nowata County, Okla., 6831 productive acres in Twps. 26 and 27n, Rs. 16 and 17e—has made possible extraction of more than 13 million barrels of crude petroleum over production which might have been expected by the continuation of primary production methods, including the use of vacuum. Foremost among the secondary-recovery methods used in this field was repressuring of the Bartlesville sand with air and gas through injection wells spaced on symmetrical patterns. Between 1925 and 1945 about 51 billion cubic feet of air and gas were injected into the producing formation, and the total recovery was increased from 23 million to about 40 million barrels of oil. To produce as much as possible of the 28 million barrels of recoverable oil remaining in the sand will require initiation of systematic waterflooding projects on many properties and continuation of air and gas injection on others.

Discovery and Development

The discovery well was completed at 640 feet in the Bartlesville sand, July 26, 1906, by Prairie Oil & Gas Company. The oil-producing formation was penetrated between 622-38 feet. A few wells were drilled in the field in 1907, but most of the drilling was done between 1908 and 1911; however, some areas in the western and southern parts of the field were not developed until 1916 to 1919.

Initial oil production of most wells drilled during the original development in the eastern part of the Delaware-Childers field was 100 to 200 barrels daily, but a few wells produced as much as 1000 to 1500 barrels the first day. Many logs record a gas sand above the oil sand, and many early wells produced large volumes of gas with the oil. Very little water has been produced from the Bartlesville sand in the Delaware-Childers area.

Most of the wells in the field flowed naturally for a short time after completion. During the early producing life of the field, much gas was wasted; and because water did no encroach, the reservoir pressure declined rapidly. When the wells ceased to flow naturally they were jack-pumped from central powers.

The quantity of oil produced by years from 1907 and 1945 from wells in the eastern part of the Delaware-Childers field is shown in Figure 1. By 1911 most of the field had been developed and the rate of oil production declined rapidly.

Vacuum was applied in 1913 and continued rather generally throughout the area until 1932, but the curve in Figure 1 shows no distinguishable increase in the rate of oil production that can be attributed to vacuum. Study of the production-decline curves of individual leases indicates that, although vacuum temporarily increased the rate of oil production from several leases, the small increases were more than offset by the rapid decline in yearly oil production from other leases. From discovery date to 1925, when air injection was started in the eastern part of the field, 23 million barrels of oil were produced by primary (including vacuum) methods.

The average oil recovery by primary-production methods from the eastern part of the Delaware-Childers field was approximately 4100 barrels per acre. A few leases (4.4 percent of the developed acres) in Sects. 34 and 35, Twp. 27n, R. 16e, produced more than 10,000 barrels per acre, and about one-third of the total acreage, mostly on the edge of the producing area, yielded less than 3000 barrels per acre.

Vertically, the Bartlesville sand in the eastern part of the Delaware-Childers field consists of a lower main body—the oil reservoir — and an upper section which is shaly, is very irregular in thickness, and grades laterally into shale. The average horizontal permeability of the oil-producing sand in 12 wells in Sect. 36, Twp. 27n, R. 16e, is 92 millidarcies, as compared with an average permeability of 67 millidarcies in 12 wells in the western part of the area.

The porosity of the oil-producing sand ranges from 18 to 26 percent. Average porosity of all the available core analyses throughout the field is 19.8 percent. In general, porosity is greater in the thicker sand sections than in the thinner sand sections along the edges and near the west end of the field.

Air and Gas Injection

Some operators began to repressure the Bartlesville sand in 1925 in the eastern part of the Delaware-Childers field by returning casinghead gas to the producing formation. Shortly thereafter, the limited volume of gas available for repressuring was augmented by the construction of compressor plants to inject air-gas mixtures. As vacuum had been applied to the sand since 1913, the formation gas was nearly depleted, but as extraneous gas was injected into the sand, the underground vacuum gradually disappeared and the injected air and gas increased the rate of oil production from the adjacent wells.

By the end of 1932 there were 28 compressor plants, with a maximum daily capacity of approximately 12,850,000 cubic feet, furnishing air-gas mixtures to 153 injection wells. These injection wells affected 4549 of the 6549 productive acres developed during primary production in the eastern part of the Delaware-Childers field. During these first eight years of repressuring operations, about 2 million barrels of additional oil were produced from the repressured area. The yearly oil production in 1932 (658,595 barrels) was more than double that immediately before repressuring (Figure 1).

In the latter part of 1932 a systematic repressuring program was started by the operators in the eastern part of the Delaware-Childers field. Five areas along the edges of the field, comprising 277 acres not developed by primary-production methods, were drilled for secondary recovery. The largest operator in the field, Sinclair Prairie Oil Company, enlarged its compressor plant in

A condensation of Report of Investigation 4019, prepared by the Petroleum Experiment Station, Bartlesville, Okla., and published by permission of the Director, Bureau of Mines, Department of Interior. Copies of the complete report may be obtained from the Bureau of Mines at Bartlesville or Washington, D. C.

SE¼ Sect. 35, Twp. 27n, R. 16e, and constructed a new plant in NW¼ Sect. 33, Twp. 27n, R. 16e. The company also drilled 247 new injection wells, converted 39 old oil wells and drilled 413 new oil wells. The drilling started east of the Verdigris River and progressed westward. Most of the wells east of the river were completed by the middle of 1936. Although a few wells were drilled west of the Verdigris River in 1933, the major drilling program started in 1936 and continued into the early part of 1939.

Well Pattern

In the development of the leases east of the Verdigris River for repressuring operations, new wells were drilled in a staggered line drive pattern, somewhat irregularly spaced, with like wells 330 to 660 feet apart. West of the Verdigris River an irregular five-spot pattern was followed with like wells 330 to 440 feet apart. Many old oil wells which roughly coincided with these patterns were reconditioned for oil production or converted for gas injection. Several wells not coinciding with the patterns or having faulty casing were plugged and abandoned.

The earlier injection wells were completed with a spudding machine, but after 1935 the Sinclair Prairie Oil Company drilled and cored its wells with a portable rotary core-drilling machine. In most wells a short joint of conductor pipe, 6⅝- or 7-inch casing, was set through the surface soil or gravel. A 6¼-inch hole was drilled into the shale section above the Bartlesville sand, where four-inch line pipe was set on a four-inch collar. Then the annular space behind the casing was mudded to the surface. The size of the hole then was reduced, and drilling was continued through the sand body and into the underlying shale to form a pocket. No injection wells were shot.

Most of the new oil wells for the repressuring program were drilled with a spudding machine, but approximately 150 of the last wells were drilled and cored with a rotary core-drilling machine. The method of drilling and completing oil wells was similar to that used for injection wells, except that in the oil wells a string of 6⅝-inch casing was set on a nipple beveled at one end. When the producing sand had been penetrated the casing was pulled, and the sand body was shot with one quart of nitroglycerin per foot of sand. The casing was rerun, and the annular space was mudded to the surface. The hole was cleaned out and drilled into the shale section to form a pocket.

Except where cleanout work was necessary, oil wells easily were converted to injection wells by pulling the rods and tubing and bailing the hole dry. As soon as possible after the conversion, air or gas was injected through the casing to keep the oil from seeping into the well bore.

Present Air- and Gas-Injection Practices

As of July 1, 1945, 21 compressor plants were operating in the eastern part of the Delaware-Childers field. Thirteen compressor units, with a capacity of approximately 4,550,000 cubic feet per day, delivered air, and 27 units, with a daily capacity of approximately 13,400,000 cubic feet, furnished gas to the 482 active injection wells.

Each of the injection wells is equipped with a meter loop containing an orifice flange with gauge and manometer connections for periodically checking the injection rate of the repressuring medium. The rate of injection in individual wells is controlled by adjusting ½-inch stopcocks in the line.

Injection pressures in the field range from 20 to 160 pounds per square inch;

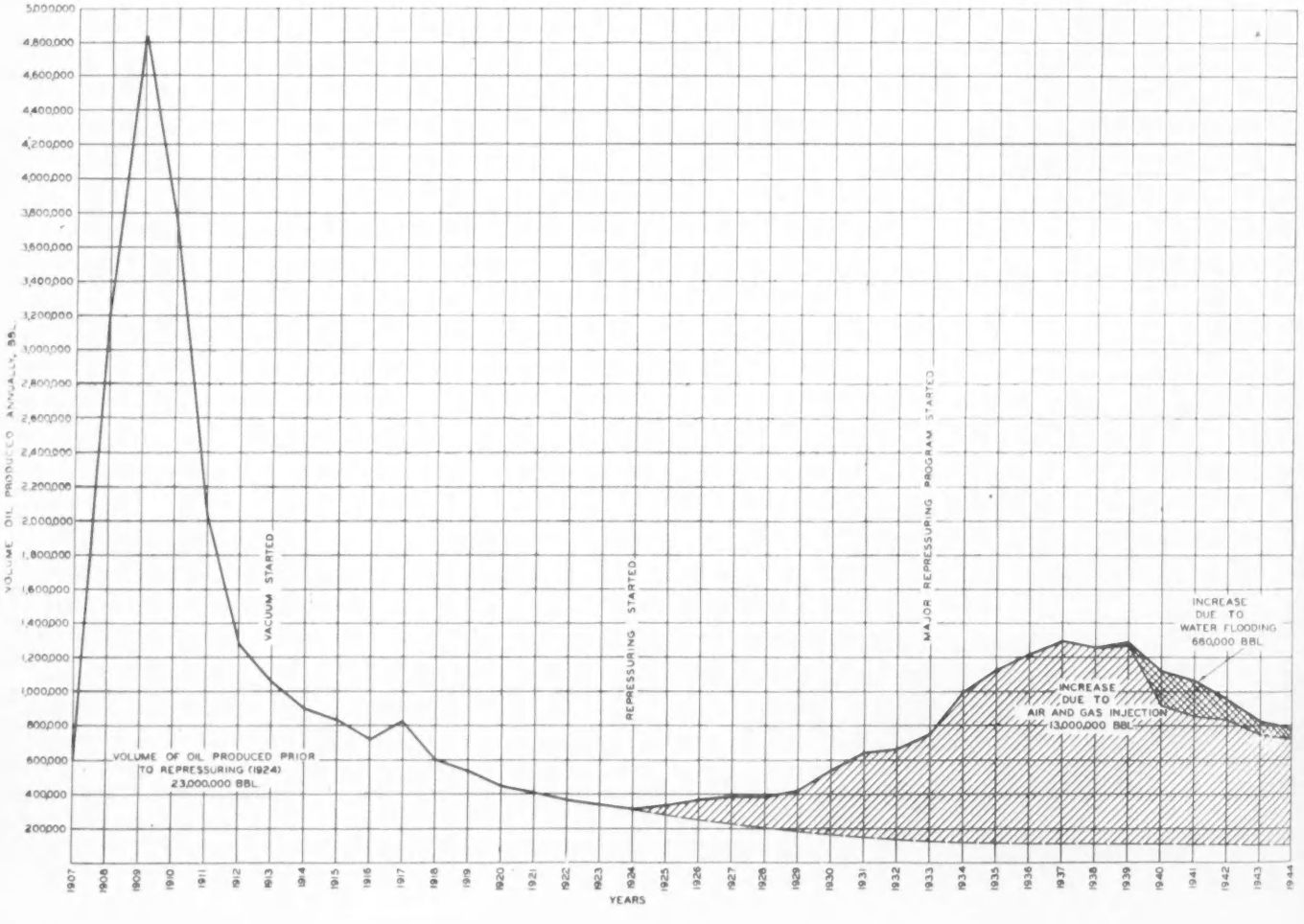
VOLUME OIL PRODUCED ANNUALLY, BBL.
YEARS
VACUUM STARTED
REPRESSURING STARTED
MAJOR REPRESSURING PROGRAM STARTED
VOLUME OF OIL PRODUCED PRIOR TO REPRESSURING (1924) 23,000,000 BBL
INCREASE DUE TO AIR AND GAS INJECTION 13,000,000 BBL
INCREASE DUE TO WATER FLOODING 660,000 BBL

Figure 1. Total oil production by years, eastern part of the Delaware-Childers field, Nowata County, Oklahoma.

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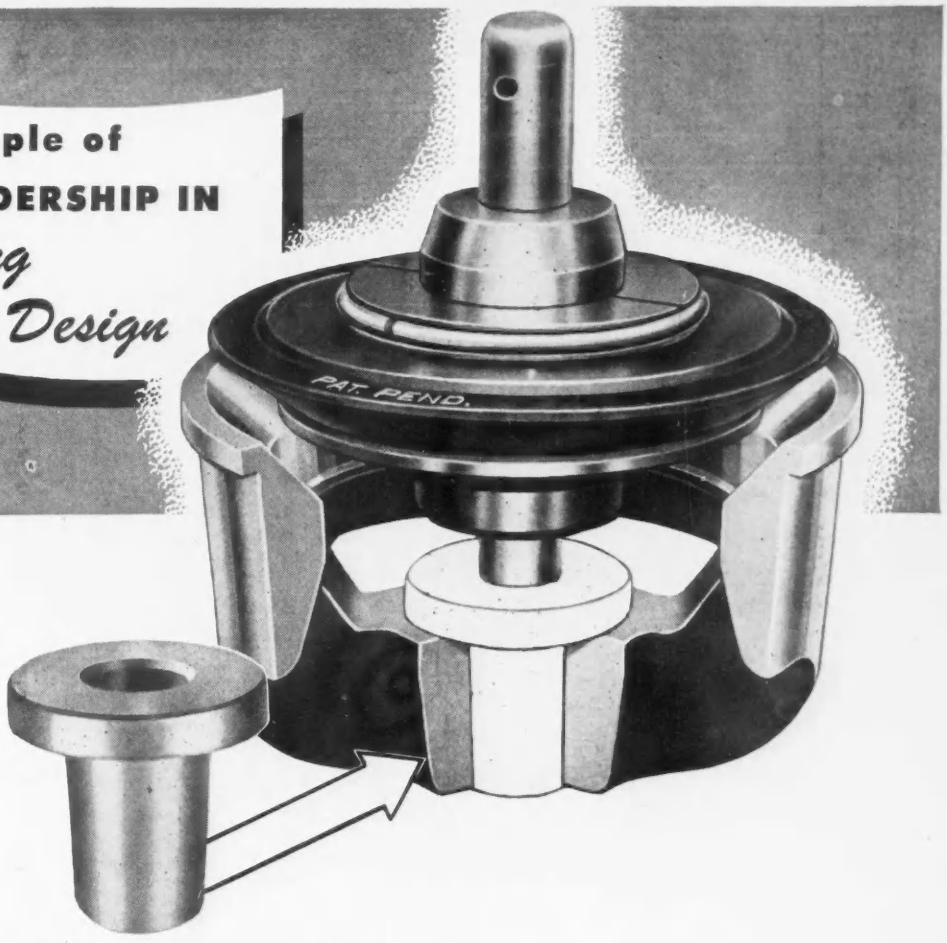

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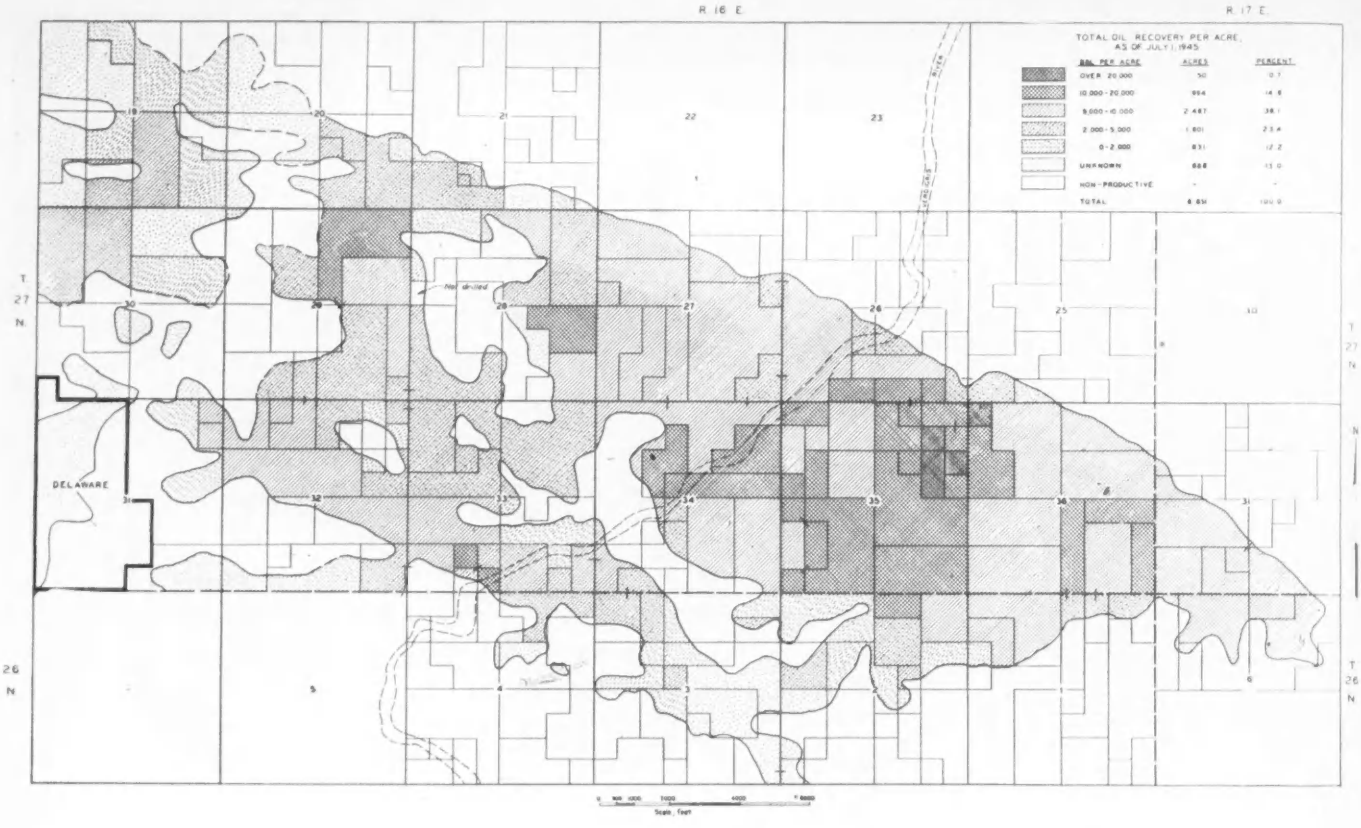

Figure 2. Total oil recovered per acre to July 1, 1945, eastern part of the Delaware-Childers field.

however, for most of the wells the injection pressure ranges between 40 and 75 pounds per square inch. To prevent oil drainage to wells owned by other operators, higher pressures are applied to edge injection wells than to inside wells.

In 1940, one operator discovered that the back pressure on some of his oil wells nearly equaled the pressure on the adjacent injection wells, indicating that the injected gas was channeling through partly depleted zones of high effective permeability. To improve this condition in some injection wells a packer was run on a string of tubing and set opposite a shaly section so as to separate the sand section of relatively high effective permeability from the section of lower permeability (and usually of higher oil saturation). Gas or air then was injected into the less permeable sand section through the tubing, if this section were below the packer, or through the annulus, if it were above the packer. No repressuring medium was injected into the partly depleted section until the oil productivities of the two zones were equalized. In five wells, where it was desirable to separate the injection zones further, two packers were set by using a string of one-inch pipe in addition to the tubing and casing so that gas or air could be injected into any of three separated zones.

Injection wells serving two or more separated zones are equipped with individual meter loops for each zone. Generally multiple injection wells are connected to a single source of gas or air; however, at a few wells two separate lines are used to permit the injection of different media above and below the packer.

Occasionally the sand face in an injection well becomes plugged with waxy material and line scale. This is usually removed by washing with gasoline and then bailing the hole dry.

Production Practices

In the producing wells a string of two-inch tubing, closed at the lower end, is suspended two to five feet above the bottom of the hole. The perforated lower joint of tubing and the working barrel above the perforations are in the pocket 10 to 20 feet below the base of the producing sand. All the producing wells are equipped with pumping jacks operated from central powers. Most of the wells are pumped two to five hours daily, depending upon the time required to lower the fluid level below the sand body. However, a head of oil always is maintained above the perforations to prevent gas from escaping through the tubing while the wells are being pumped.

Some operators in the area regulate their repressuring operations by controlling the volume of gas injected and by controlling the volume of gas produced by each oil well. That is, over a given area, equal volumes of gas are injected into each pressure well by controlling the injection pressures and equal volumes of gas are withdrawn from the oil wells by regulating (by means of ½-inch stopcocks) the back pressures on the casingheads. Because the sand conditions are not uniform, the pressures required to inject equal volumes of gas and the back-pressures necessary to equalize produced gas volumes are variable.

As of July 1, 1945 five plants were applying vacuum equivalent to 20 to 25 inches of mercury to approximately 65 oil wells in Sects. 20, 27, 28, 29, and 30, Twp. 27n, R. 16e. Usually, vacuum is applied to line wells offsetting those of other operators, except where the line wells are adjacent to injection wells.

Results of Air and Gas Injection

Repressuring started during the latter part of 1925 with the injection of about 300,000 cubic feet of gas daily into 19 injection wells on 300 acres. By 1926 the rate of oil production for the eastern part of the Delaware-Childers field had increased by about 4000 barrels per month. Between 1926 and 1928 the area under repressuring was extended to northwest; seven compressor plants were constructed, and by the end of 1928 approximately 800,000 cubic feet of air and gas daily were being injected into the Bartlesville sand. During 1929 and 1930 the number of air and gas injection wells was increased to 97, and the repressured

area was extended to include most of the eastern part of the Delaware-Childers field. To serve this area 14 additional plants with a total daily capacity of 5¾ million cubic feet of air and gas were constructed. There was little change in the rate of oil production between 1926 and 1929, but in 1930 the monthly production rate increased to approximately 55,000 barrels. By 1933, 28 compressor plants, some of which had been enlarged and their output capacity increased, supplied approximately 4,400,000 cubic feet of air and gas daily to 153 injection wells. The increased rate of oil production obtained in 1930 was maintained during 1931 and 1932.

Repressuring Development

Beginning in 1932 and continuing through 1938, the eastern part of the Delaware-Childers field was intensively developed for repressuring. In 1938, as new pressure wells were completed, the volume of injected gas reached a peak of about 12 million cubic feet per day. As a result of the increased volume of air and gas injected and the drilling of many new oil wells, the oil production increased rapidly and by 1937 had reached approximately 112,000 barrels a month.

On July 1, 1945, 21 active compressor plants were furnishing about 11½ million cubic feet of air and gas daily to 482 injection wells and though the monthly rate of oil production had decreased to approximately 56,000 barrels, the average rate was still 2½ times that of January, 1925. The cumulative oil production to July 1, 1945, from the eastern part of the Delaware-Childers field was approximately 40 million barrels or 5829 barrels an acre, about 17 million barrels of which had been produced since the start of repressuring. By extrapolating the normal decline curve, shown in Figure 1, it is estimated that 13 million of the above 17 million barrels of oil were recovered as a result of secondary recovery operations.

As of July 1, 1945, 6448 acres in the eastern part of the Delaware-Childers field had been developed for secondary recovery operations. About 10.4 percent of the total developed acres had produced more than 5000 barrels of oil per acre. With the exception of a few scattered leases, most of the highly productive leases were in Sects. 34, 35 and 36, Twp. 27n, R. 16e. From 3000 to 5000 barrels of oil per acre had been recovered from 20.5 percent and from 1500 to 3000 barrels of oil per acre had been recovered from 32.2 percent of the total productive area. Less than 1500 barrels of oil per acre had been recovered from about one-third of the area.

The above recoveries do not necessarily indicate the relative efficiency of secondary recovery on various leases nor are the recoveries to date indicative of the final recovery that will be obtained. Repressuring has been in progress in some areas much longer than others. Some few leases have been subjected to flooding (to be described later) in addition to air and gas repressuring. Secondary-recovery operations in the field will not be completed for many years, but an average of 2217 barrels of oil per acre had been recovered from the 6448 developed acres by secondary recovery methods on July 1, 1945. Several leases, totaling 642 acres, principally in the

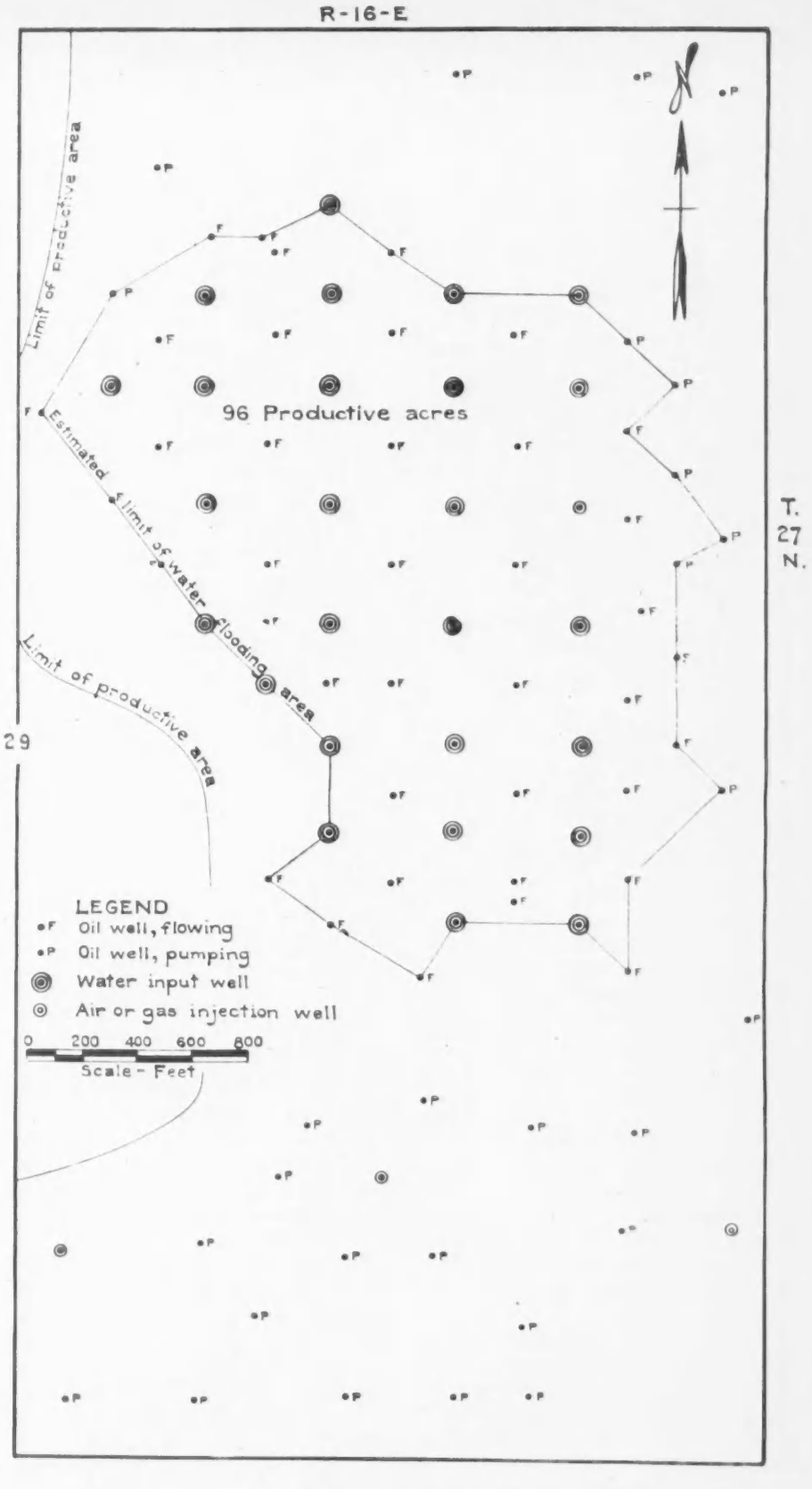

Figure 3. C. C. Harmon water-flooding project, 29-27n-16e, Nowata County.

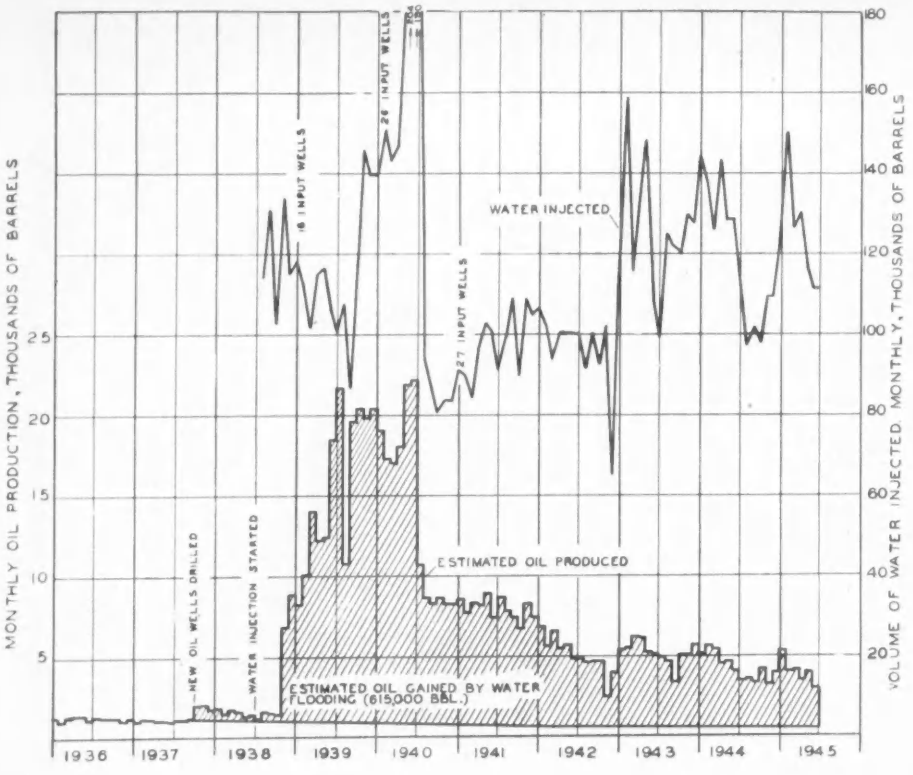

Figure 4. Oil produced and water injected, C. C. Harmon water-flooding project, eastern part of the Delaware-Childers field.

western part of the area, that were formerly repressured either had been abandoned or were operating by primary-production methods, and 71 acres that were formerly water-flooded had been abandoned. As of July 1, 1945, 5570 acres were being repressured and 165 acres were being water-flooded.

Figure 2 shows the total quantity of oil recovered per acre to July 1, 1945, for different areas in the eastern part of the Delaware-Childers field.

Water Flooding

The early history of three of the four water-flooding projects in the Delaware-Childers field has been discussed in a Bureau of Mines report by Taliaferro and Logan.[1] Three of these water floods were confined to edge leases in the less prolific areas of the field. Cumulative oil produced to July 1, 1945, from the 239 acres flooded in the four projects was about 680,000 barrels. Water flooding as a method of secondary recovery has yet to be tried on a large scale in the Delaware-Childers field, and studied engineering consideration should be given to this method as a final means of recovering oil.

The largest water-flooding project in the eastern part of the Delaware-Childers field involves an area of approximately 96 acres in Sect. 29, Twp. 27 n, R. 16e. (Figure 3). One hundred eighty-seven acres along the outer edges of the property are not being water-flooded. The property was first drilled in 1907 and 1908, and drillers' logs and cores taken in later years show that the thickness of the Bartlesville sand ranges from 21 to 67 feet; the weighted average thickness is 50 feet.

By primary-production methods (including vacuum application), 1,216,240 barrels of oil were produced, about 4300 barrels per acre from the 283 productive acres. Air and gas injection was started into three wells in the northern part of the area in 1926, and by 1929 air and gas were being injected into nine wells on the property. The productive area was enlarged in 1929 by drilling additional oil wells along the west and southwest edges. During 12 years of air and gas repressuring ending in June, 1938, about 306,000 barrels of oil or 1080 barrels per acre were produced, which increased the total oil recovery to 5380 barrels per acre from the 283 productive acres. The volume of recoverable oil originally under this property was calculated to have been approximately 3,900,000 barrels, and that produced before water flooding was begun represents about 39 percent of the total volume.

Beginning in 1937 and continuing through 1940, 96 acres (Figure 3) were developed for water flooding by drilling 31 oil-producing wells, 27 water-input wells, and by plugging nine old oil wells The flood was developed in a five-spot pattern with early like wells spaced 440 feet apart, but later the like wells were drilled 440 feet apart east to west and 330 feet apart north to south.

The water-input wells are tubed in the open hole with 1½-inch tubing cemented at the top of the sand. Producing wells are completed for pumping with a string of 6⅝-inch casing and for flowing with a string of 5-3/16-inch casing cemented at the top of the sand. Both input and producing wells are shot with about one quart of nitroglycerin per foot of oil-producing sand.

Analyses of cores from input wells, drilled at the time the property was developed for flooding, indicate the sand has an average porosity of 21.5 percent and an average permeability of 84 millidarcies.

Water for flooding the sand is obtained from the Verdigris River and is supplemented with water produced from oil wells. The water is aerated to remove excess carbon dioxide and then is treated with chlorine to kill organic matter. Lime and ammonium sulfate are added to precipitate iron compounds and to stabilize the carbonates. Flow tests indicate that the water remains at least four hours in the chemical treater to permit most of the precipitates to settle out, and then passes through the filter to the clear well. The filter is back-washed about three times each week and the water input wells about once each month.

Injection Decreased

During the early life of the flood, about four barrels of water per foot of sand thickness were injected daily into each of the input wells, totaling about 120,000 barrels per month for all wells (Figure 4). In 1940, the rate of water injection was decreased because the operator considered the water input:oil produced ratio to be excessive for economical operations. Since then the rate of injection has averaged about 2½ barrels of water per foot of sand thickness —with inside wells receiving slightly more water per foot of sand thickness than edge wells.

Injection pressures have increased gradually since flooding began. In July, 1942, injection pressures at the wellheads ranged from 160 to 625 pounds and averaged 473 pounds per square inch, whereas, by June, 1945, the injection pressures were more uniform, ranging from 565 to 700 and averaging 613 pounds per square inch. In 1945, the volume of water injected was controlled largely by the pressure capacity of the surface injection lines near the plant and by the pressure drop in the lines to the more remote wells.

In July, 1945, 40 producing wells in the flood area flowed their production and six wells along the outer edges of the tract were pumped. During the early life of the flood, production from the flowing wells was restricted by using

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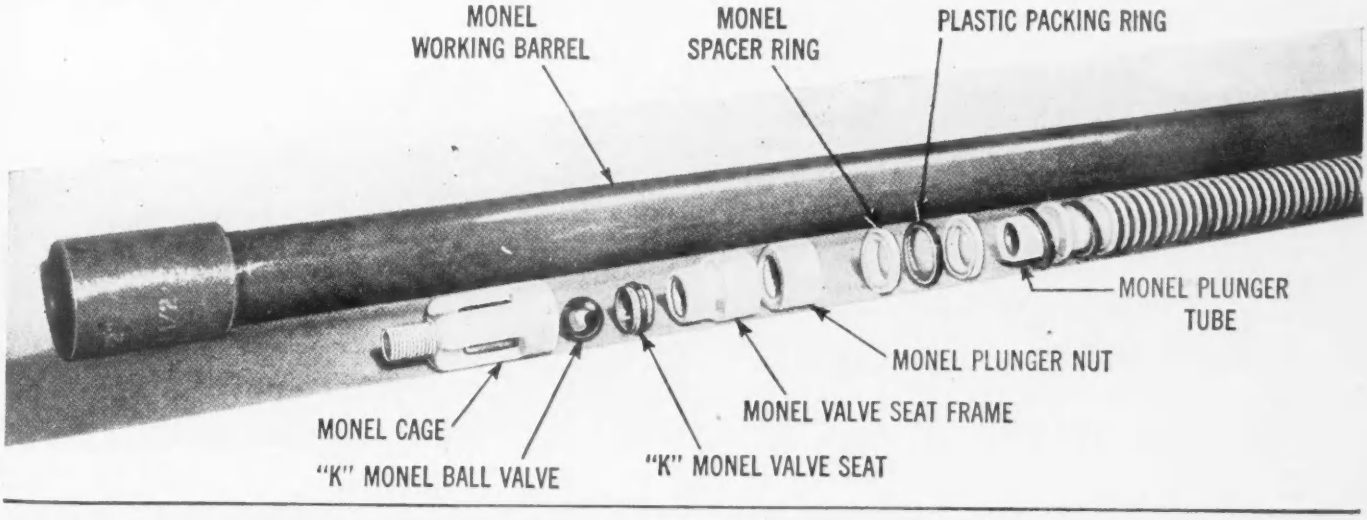

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¼-inch chokes at the tubing heads, but since 1942 they have flowed through two-inch tubing, unobstructed, into the receiving tank with only 15 to 20 pounds per square inch line pressure at the wellheads. On July 1, 1945, five pumping wells along the east edge of the flood were pumped continuously, and one south-edge well was pumped five hours out of every 24.

Settling Difficulties Overcome

During the early life of the flood some settling difficulties were experienced as a result of the formation of emulsions, but these were overcome, and since then the produced oil and water are separated in a receiving tank without the aid of heat or chemicals. Before water flooding started some water, which probably entered the sand from leaking casings, was produced with the oil. Since the initiation of water flooding the water production has increased steadily to a rate of about 2500 barrels a day on July 1, 1945, with about 125 barrels of oil.

Available production records do not distinguish between oil produced from water-flooded and non-water-flooded portions of the three leases. To estimate the volume of oil produced each month from the water-flooded portions of the leases, the production from the non-water-flooded areas was estimated carefully by extrapolation of the production decline curves and by giving weight to the acreage involved, acre-feet of sand, and to the productive capacity of the non-flooded and flooded areas before flooding was initiated.

Although water injection did not start until July, 1938, the drilling of new wells for the flood development increased the oil production during the last few months of 1937. About four months after water injection was started, the rate of oil production showed a sharp increase and reached a peak of 22,187 barrels during June, 1940. This rate of production was about ten times the rate prevailing immediately before flooding was started. By the addition of other water-input wells, this peak production rate was maintained for about a year. The sharply reduced rate of water injection about the middle of 1940 resulted in an immediate decrease in the rate of oil production to less than half of the peak rate. Since that date the rate of decline has been gradual.

It was estimated by extrapolating the decline curve of oil production due to air and gas injection (Figure 4) that to July 1, 1945, the flood has resulted in the recovery of 615,050 barrels of oil over and above that which would have been recovered by the continued use of gas injection. This recovery was effected by injecting 9,813,462 barrels of water or with a water-injected:oil-produced ratio of 13.6. On July 1, 1945, the current ratio of water injected to oil produced was about 35.

Three other small water-flooding projects have been initiated in the eastern part of the Delaware-Childers field, but all have been on edge leases where the sand is thin and broken. The three projects have flooded a total of 93 acres. The results obtained do not compare with those obtained on the C. C. Harmon project, and all may be considered failures financially.

Conclusions

Air and gas injection in the eastern part of the Delaware-Childers field may be pointed to as among the most successful repressuring programs in Oklahoma. By injection of 51 billion cubic feet of air and gas into the Bartlesville sand between 1925 and 1945, approximately 13 million barrels of additional oil were recovered or a barrel of oil for each 3920 cubic feet of air and gas injected. It is noteworthy that these 13 million barrels of oil were recovered after approximately 23 million barrels of oil had been produced by primary-production methods. This additional oil recovery represents 56½ percent of the total oil production before repressuring started. At prices prevailing during that period, the 13 million barrels of increased oil sold for about $13,690,000.

Based upon the original oil content, it is estimated that the 23 million barrels of oil produced before 1925 by primary production methods represented about 33.5 percent of the total recoverable oil, and that by 1925 the average oil saturation of the productive sand throughout the field had been reduced from the original 58.8 percent to about 47.6 percent.

Since air and gas injection was started in 1925, about 16 million barrels of oil, representing 57.4 percent of the original recoverable oil, were produced from the eastern part of the Delaware-Childers field, exclusive of the water-flooded areas. It is estimated that the production of this volume of oil reduced the average saturation of the oil-producing sand to about 39.8 percent.

How much additional oil might have been produced by the continuation of primary-production methods is difficult to estimate. When secondary-recovery practices were initiated, many leases had reached or were approaching their economic limit of operation by primary-production methods. The decline in the rate of oil production indicates that in this field the average oil saturation by primary methods might not be reduced economically much below 46 percent.

Much additional oil remains to be recovered in the eastern part of the Delaware-Childers field by continued air and gas injection. By extrapolating the curve of oil production due to air and gas injection (Figure 1) it is estimated that about 8½ million barrels of oil can be produced by existing production methods between 1945 and 1960. This would decrease the average oil saturation of the sand from 39.8 to 35.7 percent. Few definite data are available to estimate average residual oil saturations after air- and gas-drive operations become unprofitable. However, from the above estimated average oil saturation, and from calculations of the present oil saturation of the sand underlying 13 leases nearing their economic limit, it is probable that the average oil saturation of the sand cannot be reduced profitably below 35 percent by air and gas injection.

It is calculated that, as of July 1, 1945, the average saturation of the Bartlesville sand underlying the most successful water flood in the field (C. C. Harmon project) was 31 percent. The estimated oil production from this flood, as indicated by extrapolating the production-decline curve (Figure 4) to January 1, 1948, is 118,000 barrels. The production of this volume of oil would reduce the average oil saturation of the sand to 29.6 percent.

The operation of the three other water-flooding projects in the field proved to be unprofiitable and they were abandoned. The residual oil saturations of the sand underlying these properties were much higher than the saturations mentioned above for the successful flood. The Bartlesville sand in these areas is comparatively thin and impermeable, and the development and operation of these projects probably were inefficient. These factors may have contributed to the higher residual oil saturations.

However, unless the recoverable oil reserve is high enough to pay development and operating costs, it is not economically feasible to initiate new projects. The history of the abandoned water-flooding projects indicates that when the average oil saturation of the sand in the eastern part of the Delaware-Childers field is reduced to 35 percent or less, many other leases may be unprofitable to water-flood, and additional "recoverable oil" will be lost. In July, 1945, the oil saturation of the sand in the field, exclusive of the water-flooded area, averaged 39.8 percent. Oil sands with comparable oil saturations have been profitably water-flooded in this and similar fields. Water flooding in the eastern part of the Delaware-Childers field can be expected to recover much oil that otherwise might be lost.

REFERENCE

[1] Taliaferro, D. B., and Logan, David M., "History of Water Flooding of Oil Sands in Oklahoma," Bureau of Mines Report of Investigations 3728, 1943, p. 182.

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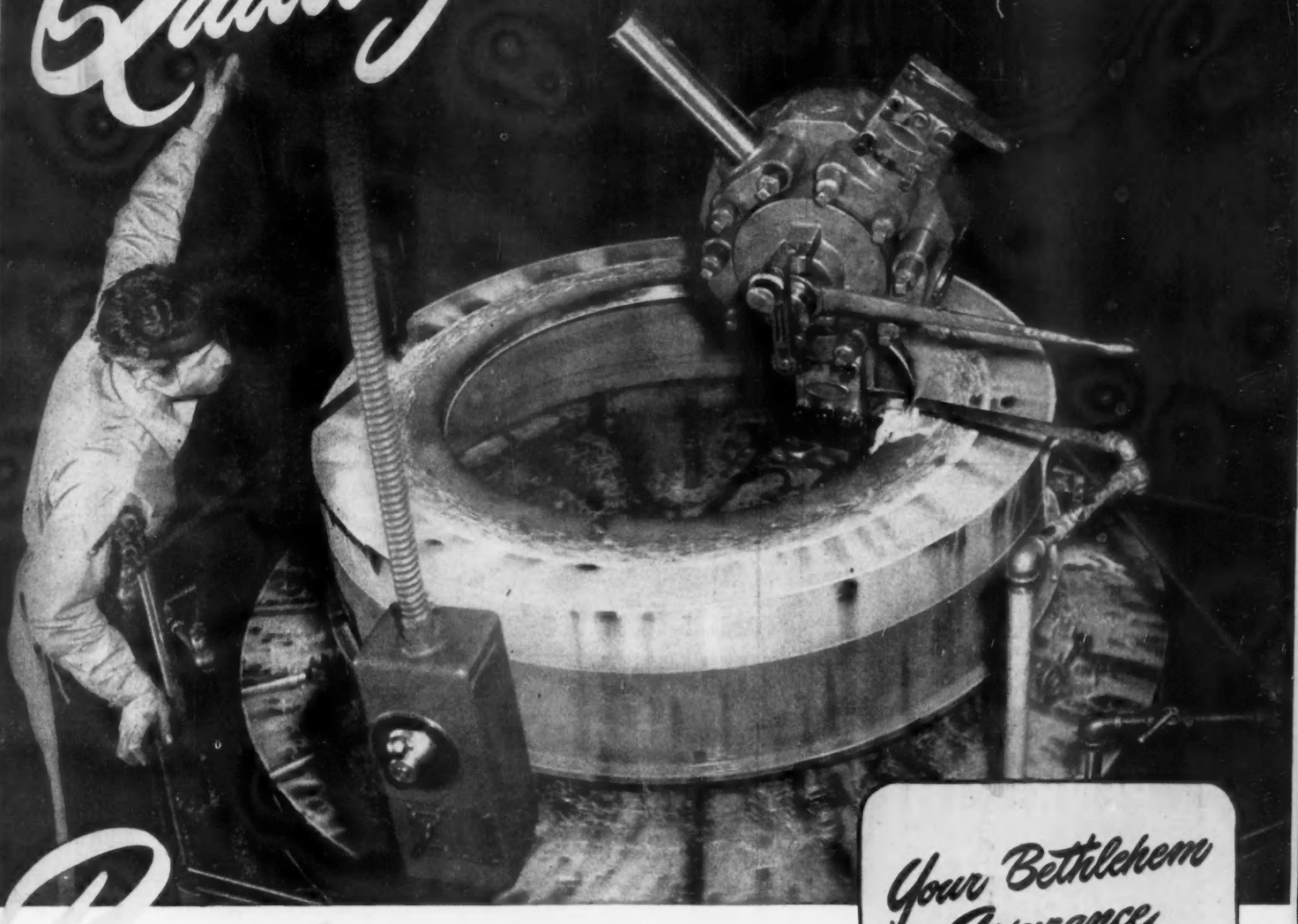

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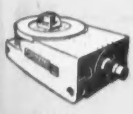
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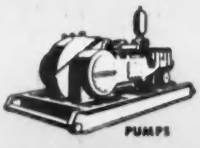
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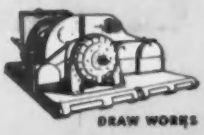
CROWN BLOCKS

TRAVELING BLOCKS

SWIVELS


DRAW WORKS

Carry Demountable A-Frame Legs Beneath Truck Bed

LIFTING DEVICES

Time saved in setting up and dismantling a light A-frame on the rear of their truck bed enables one production crew to do considerably faster work on the average small field jobs where light winching or hoisting is required. Instead of equipping the truck with a semi-fixed frame which takes up valuable space when the winching apparatus is not in use, a system was devised which permits locking the two legs of the A-frame in slots provided in the rolled steel edge at the rear of the truck.

As shown, each slot has a pin run through it which prevents the leg from slipping out once the latter is set in position. When not in use, the legs and sheave assembly are carried in a boxed-off portion of space beneath the truck bed. It requires only several minutes to set up the frame, and when it is dismounted, the truck bed is free of all fittings or projections which might hinder its use for normal hauling purposes.

$5.00 is paid for each illustrated acceptable contribution. Mail to The Editor, THE OIL WEEKLY, P. O. Box 2608, Houston 1, Texas

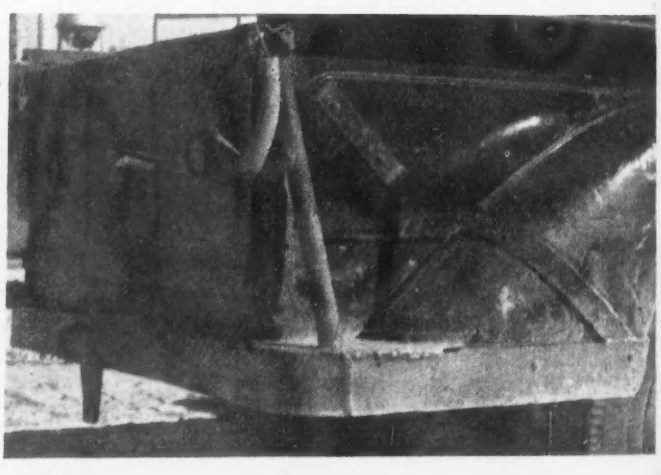
Protects Rear Fenders Of Field Trucks

EQUIPMENT CARE

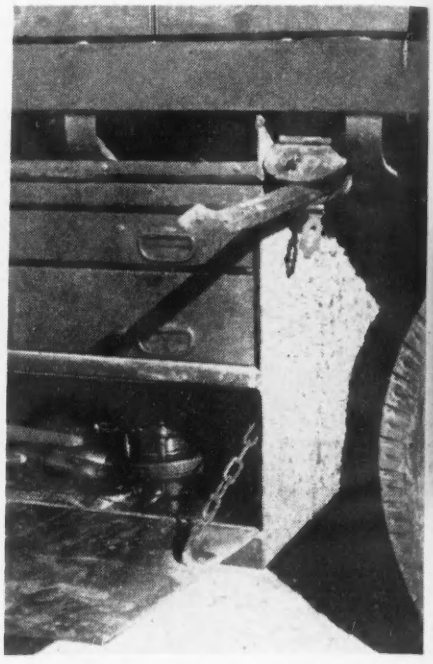
On production work where vehicles are off of the road more than they are on it, the rear fenders are always being torn back at the bottom when the wheels pass over ditches and other low places. To prevent this, one contractor reinforces the fenders by passing the bumper entirely around the back side of the fender. On the inside of the back of the fender, another plate is attached to the end of the bumper with stove bolts placed through the fender so that the fender is supported on both sides.

To further stiffen this vulnerable spot on the truck, a plate is set in the inside corner of the bumper between the bumper and the fender and it is also bolted to the plate which is fitted into the inside of the fender.

A short piece of one inch pipe is then welded between the corner of the bumper and the upper corner of the side of the truck bed. The fender is finally stiffened by welding a 1½-inch strap iron between the side of the truck bed and around the back of the fender. It is fastened to the end of the bumper and the plate on the inside of the fender. The truck shown has traveled over 100,000 miles and the fender is still in good shape.



Store Crow Bars on Trucks

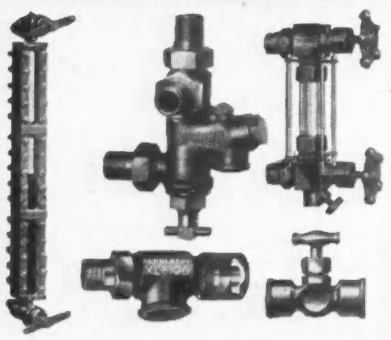


TOOL STORAGE

Simplified handling and storage of heavy crow bars used in connection with service work on the lease, is accomplished by one company through installation of a tubular container mounted transverse to the length of, and beneath the truck bed. Made of a length of salvaged tubing, the container is closed at one end, and provided with a hinged cover at the other end, the latter fitted with a hasp for locking.

Several advantages result from carrying this type of tool in such a position. The heavy bar is more easily reached and replaced by a man standing on the ground; it is unnecessary to carry the tool into the shop or storage yard at night when the truck has to remain outside overnight; and while travelling between jobs, the bar need not be carried on the flat truck bed where it is likely to roll off, particularly if side boards have to be removed for hauling of other equipment.

PENBERTHY
QUALITY PRODUCTS



Penberthy liquid level gages of various types—injectors—ejectors—all so widely used throughout the oil industry because they have always been dependable under the most severe service conditions.

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Typical "Oilwell" Shop in which sub-surface pumps are assembled to meet specific pumping conditions.

"Oilwell" Sub-Surface Pumping Equipment

METALLURGY is a highly important factor in the development of sub-surface equipment to withstand the varying conditions of corrosion, abrasion, temperature and depth. After years of research and field-testing, "Oilwell" offers Sub-Surface Pumps, Sucker Rods, Polished Rods and related equipment; manufactured in a wide range of materials, heat-treatments and finishes to meet all types of well conditions.

Sub-Surface Pumps. In designing sub-surface pumps, "Oilwell" Engineers have consistently held to A.P.I. Specifications and to maximum interchangeability of parts. "Oilwell" and Neilsen Pumps are both divided into two basic types: (1) rod type with either traveling or stationary barrels and (2) tubing types. Either type can be fitted with a large variety of plungers or traveling valves.

"Oilwell" barrels and plungers are of one-piece construction while the Neilsen Pump Division features sectional liner type pumps.

Sucker Rods. "Oilwell" Engineers have developed a complete line of rods which includes numerous grades of carbon and alloy steel to meet specific pumping conditions. All are manufactured to A.P.I. Specifications.

For shallower wells with non-corrosive fluids, "Oilwell" offers rods normalized over their entire length to provide outstanding service at small cost.

To withstand excessive corrosive action and heavy loads, "Oilwell" has designed and developed special heat-treating processes which give toughness, ductility and fatigue-resistance to rods having the proper chemical composition to resist corrosion.

Well-Head Equipment. "Oilwell" Stuffing Boxes, Flow Tees, Polished Rods, Polished Rod Liners, Casing Heads and Tubing Hangers are all made with the careful attention to detail and high precision, characteristic of all "Oilwell" equipment.

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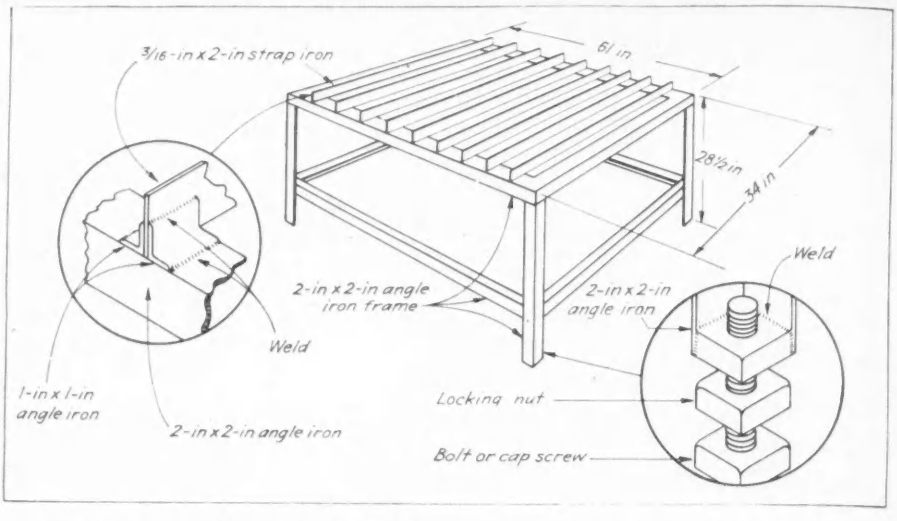
TRADING POST SECTION
ON PAGE 88 OF THIS ISSUE

Fabricated Work Supports For Oxy-Acetylene Cutting



WELDING AIDS

Depending upon the needs of the individual shop, design and dimensions of work supports for oxy-acetylene shape-cutting may vary widely. But to be suitable for best results, such supports must meet two basic requirements. They must be level and steady and they must hold the work in a manner that will not interfere with clear passage of the cutting oxygen stream through the material being cut. Supports illustrated here meet these requirements and can be fabricated readily from standard steel shapes.

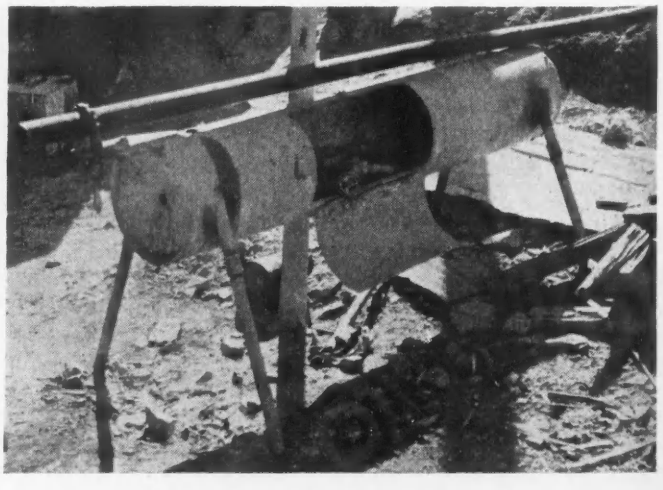
The frame of the welded cutting table, illustrated in Figure 1, is made from 2 by 2-inch angle iron. Stringers across the top are 3/16 by 2-inch strap steel supported as shown by short pieces of 1 by 1-inch angle iron welded to the top of the frame. T-beams of suitable size, spaced 12 to 18 inches apart, can be used in place of the strap steel if desired. Dimensions shown in the sketch can be modified to adapt the table to machines or limits of work space.

Welding a nut of a large bolt inside the angle of each leg provides a device for levelling the table. Simply turn the bolt in or out to change the adjustment. A second nut can be used to lock the bolt in position once the table is perfectly levelled.

Simplify Field Jobs with Demountable Storage Bin

TOOL CARE

For minor repair work around the lease, where it is unnecessary to keep on hand a great quantity of miscellaneous fittings and tools on the service truck because of the latter having to move on to other jobs, it frequently may be desirable to provide a small combination pipe rack and storage bin similar to the one illustrated.

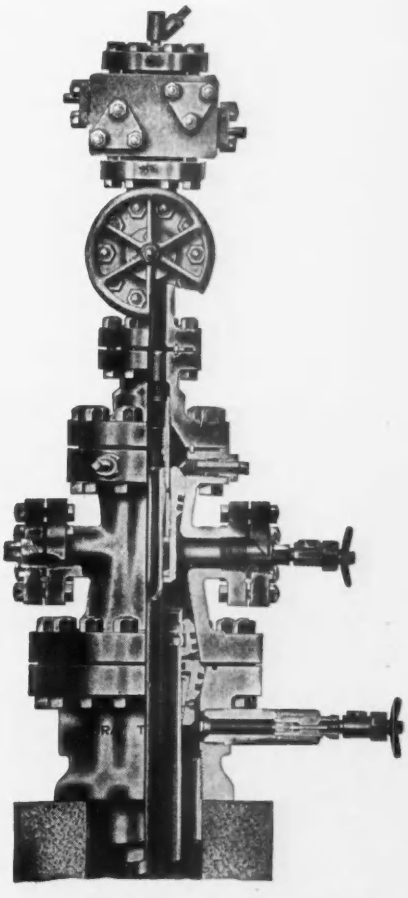


A salvaged water heating tank, preferably five or six feet long, is fitted with four short legs, which are welded to the side of the shell as shown. Collars six or eight inches from the tank allow extension legs to be screwed on when the unit is set up on the job. Access to the bin is provided by cutting out a longitudinal section and fitting it with hinges and a hasp, the door being made to drop down and out of the way when opened. The tank has ample room for the average sizes of small fittings, nipples of moderate length, and the four extension legs when the unit is being transported.

Fine Individual Parts Coordinated to Relegate Many Parts to the Position of Accessories

Gray Systems of Well Control are designed to provide for the practice of installation, removal, and renewal of parts as needed after each part has completed its full operating function, and for the effecting of repairs to the parts which may give trouble. The insertion of a stopper, the simple equivalent of a cork in a bottle, permits the installation with control of parts as they are needed and their removal with control after full completion of their operating function for use on other wells. With Gray Systems of Well Control, valves and other equipment are accessories which may be used over and over again, removed when not needed, reinstalled when and where needed, and repaired when the necessity arises.

Gray Systems of Well Control are on the job around the world, shouldering the problems of men who have to work in well control. Our library of knowledge gained from the experience of 25 years, from problems solved with men who actually drill oil wells, is available to you when you use Gray Systems of Well Control.



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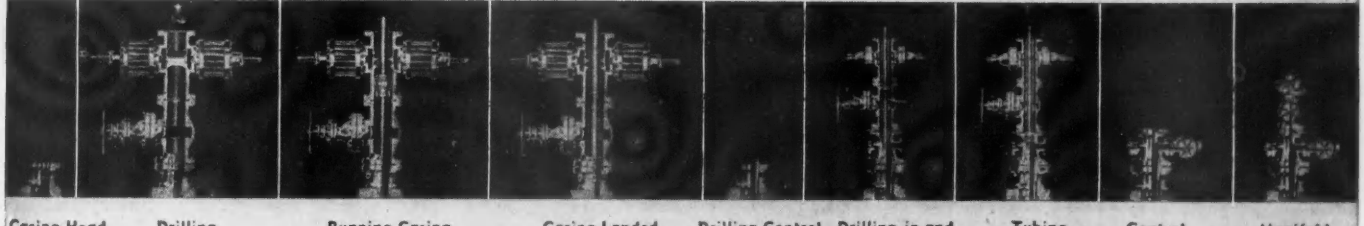


Crude Production at High for Year; Stocks Climb to Early 1944 Level

Crude production in the week ended May 3 was boosted to a new high for the year, according to The API. The week's refinery activity also showed an increase, with special emphasis given to gasoline output.

Stocks of crude continued their climb and reached highest ground since early 1944. Inventories of heavy fuel oils and gasoline continued their respective seasonal ups and downs, but stocks of the lighter fuel oils still could not start their upward swing.

Daily crude production increased 21,000 barrels in the week of May 3, to average 4,951,000 barrels, which was 230,000 barrels or 4.9 percent more than the average output of a year ago. This new daily output average set a new high for this year and was only 10,000 barrels under the all-time peak reached in June of last year.

Crude runs to refinery stills increased 91,000 barrels a day to average 4,816,000 barrels daily during the week. That was an increase of 152,000 barrels or 3.3 percent over average runs of the like period of last year.

Refinable crude stocks totaled 235,383,000 barrels on April 26, the Bureau of Mines reported, representing an increase of 1,332,000 barrels during the preceding seven days and an increase of 10,940,000 barrels or 4.9 percent over stocks a year before.

The week's output of gasoline, including natural blended, totaled 14,383,000 barrels, an increase of 170,000 barrels over the previous week and 595,000 barrels over the like week of last year. Reductions amounting to 355,000 barrels were made from stocks of finished and unfinished gasoline lowering them to 103,505,000 barrels. That amount was 5,309,000 barrels or 5.4 percent more than was in storage a year before.

Distillate fuel oil production was cut back 141,000 barrels to 5,294,000 barrels for the week, which was 52,000 barrels less than output of a year ago. Stocks were lowered 387,000 barrels to 31,899,000 barrels and at that time were 586,000 barrels or 1.8 percent lower than stocks held a year before.

Production of residual fuel oils totaled 7,836,000 barrels for the week, a drop of 350,000 barrels from the previous week's output and 1,025,000 barrels from last year's comparable week. Latest report on stocks of this heavy fuel showed that additions totalling 276,000 barrels boosted inventories to 42,944,000 barrels. That figure was 2,905,000 barrels or 7.3 percent higher than that reported a year before.

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod. Barrels Daily	Crude Oil Prod. Week Ended	Runs to Stills Barrels Daily	Runs to Stills Week Ended	Crude Stocks Barrels	Crude Stocks Week Ended	Gasoline Stocks Barrels	Gasoline Stocks Week Ended	Gasoil and Distillate Stocks Barrels	Gasoil and Distillate Stocks Week Ended	Residual Fuel Oil Stocks Barrels	Residual Fuel Oil Stocks Week Ended
Highs:												
1942	4,337	2- 7	3,961	1- 3	263,208	3-28	[1]109,281	3-14	47,861	11-14	95,857	1- 8
1945	4,944	7-21	[1]5,140	8-18	227,554	10-13	99,012	3-24	45,341	11-17	56,074	1- 6
1946	[1]4,961	6-15	4,968	12-28	229,430	3- 2	105,233	2-16	[1]67,286	11- 9	61,636	11- 2
1947	4,951	5- 3	4,986	3-15	235,383	4-26	107,576	3-29	58,034	1- 4	53,285	1- 4
Lows:												
1945	3,621	10- 6	3,409	10- 6	[2]211,813	8-25	70,791	10-13	26,483	3-17	38,548	5-26
1946	4,403	3- 9	4,498	1-12	218,193	1- 5	85,324	9-28	25,131	3- 9	37,289	4- 6
1947	4,531	4-11	4,667	4-12	220,313	2- 8	94,882	1- 4	31,470	4-19	42,668	4-26

TRENDS OF 1946 AND 1947

Trends in Week Ended	Crude Oil Production Daily	Crude Oil Runs to Stills Daily	Crude Oil Stocks Week End	Gasoline Production Weekly	Gasoline Stocks Week End	Gasoil and Distillate Production Weekly	Gasoil and Distillate Stocks Week End	Residual Fuel Production Weekly	Residual Fuel Stocks Week End
1946:									
January 5	4,548	4,651	218,193	14,488	98,494	5,923	35,199	8,867	42,371
January 26	4,626	4,553	220,544	13,622	101,737	5,720	29,498	8,411	39,722
February 23	4,714	4,595	226,699	13,175	104,709	5,728	25,398	7,913	39,290
March 30	4,425	4,684	224,994	13,896	104,715	5,337	28,240	8,738	37,746
April 27	4,672	4,685	224,443	14,228	99,631	5,568	30,466	9,204	39,404
May 25	4,759	4,857	222,214	14,312	95,769	5,463	32,973	8,908	43,368
June 29	4,957	4,854	223,883	14,500	92,333	5,325	37,762	8,828	46,477
July 27	4,926	4,896	223,756	14,535	88,626	5,817	44,316	8,217	49,517
August 31	4,833	4,911	227,132	15,014	87,217	5,630	53,134	8,539	53,173
September 28	4,778	4,829	223,043	14,675	85,324	5,632	59,827	8,172	57,657
October 26	4,730	4,758	221,184	14,863	86,423	5,710	65,499	7,728	60,872
November 30	4,795	4,707	227,693	15,145	88,371	5,258	66,062	7,672	58,647
December 28	4,713	4,968	225,995	15,604	93,126	5,931	58,941	8,181	53,427
1947:									
January 4	4,649	4,917	223,291	15,281	94,882	5,857	58,034	8,375	53,285
January 25	4,672	4,820	221,655	14,624	99,801	5,630	50,357	8,224	48,558
February 22	4,786	4,860	224,580	14,668	103,904	5,929	40,739	8,542	44,919
March 29	4,865	4,843	227,529	14,396	107,576	5,969	32,737	8,668	43,364
April 5	4,892	4,772	230,401	14,374	106,966	5,653	32,358	8,206	43,541
April 12	4,913	4,667	231,546	14,090	106,221	5,499	32,019	8,232	42,946
April 19	4,912	4,709	234,051	13,966	105,592	5,263	31,470	7,961	42,749
April 26	4,930	4,725	235,383	14,213	103,860	5,435	32,286	8,186	42,668
May 3, 1947	**4,951**	**4,816**	.....	**14,383**	**103,505**	**5,294**	**31,899**	**7,836**	**42,944**
May 4, 1946	4,721	4,664	[3]224,443	13,788	98,196	5,346	32,485	8,861	40,039
Change:									
In Week	+21	+91	+1,332	+170	—355	—141	—387	—350	+276
In Year	+230	+152	+10,940	+595	+5,309	—52	—586	—1,025	+2,905
In Year	+4.9%	+3.3%	+4.9%	+4.3%	+5.4%	—1.0%	—1.8%	—11.6%	+7.3%

[1] All time peak. [2] Lowest since December, 1921. [3] Stocks, April 27, 1946.

Prices for Refined Products Remain Generally Unchanged

Prices for all refined products remained generally firm and unchanged throughout the week, and only reports of price shading on No. 2 fuel at New York harbor indicated any market weaknesses.

Almost all areas reported good demand for all products, with gasoline becoming stronger and the seasonal domestic letup on fuel oil more than offset by increased industrial call.

An Oklahoma refiner advanced his No. 6 fuel oil posting 5 cents to $1.80 per barrel, and an East Texas refiner hiked his 15 cents to $1.65 to account for the only price changes in the Mid-Continent area. These raises did not, however, alter the price ranges existing in the respective districts. No. 6 fuel still ranged from $1.64 to $2.15 per barrel in Oklahoma and from $1.65 to $1.78 in East Texas.

All products were reported short across the board by central Michigan refiners, who were able to care only for regular customer requirements. No price changes were reported, but it was said that they were "very firm."

Prices were reported unchanged by western Pennsylvania refiners. Gasoline was reported strong in demand and No. 2 fuel oil was still moving very well. Call for No. 2 fuel from Ohio was still reported heavy due to the strike-bound Toledo refinery.

Gasoline was in good demand along the eastern seaboard and light fuels were steady, according to East Coast suppliers. Although no price changes were reported from this area, renewed rumors of shading of .15-cent off the posted barge lot price of No. 2 fuel at New York harbor were received. However, the price was generally reported firm at 6.7 cents.

Phillips Makes Pay Hikes

Phillips Petroleum Company has announced supplementary payments and wage rate increases for employes. The adjustments were made due to "unsettled price conditions." Salary adjustments will continue at least through December 31, Board Chairman Frank Phillips said.

Oklahoma Well Drills Below 17,260 After Completing Fishing Job

World's deepest test drilling below 17,260 feet following successful fishing job; wild gasser killed, crew starts fishing; attempt made to extend Witcher field production southeast; Cities Service to drill through Oklahoma City structure with new test; Davon Oil asks spacing and drilling pattern for new Southeast Lima pool; new oil and gas pool appears likely for Lincoln County; wildcat opens shallow oil pool in Cotton County; important wildcat in McClain County gets gas show on test; Lindsay area well flows an estimated 150 barrels per hour on test.

Caddo County: Following successful completion of the deepest fishing job, The Superior Oil Company of California's Weller 51-11, NW NW NE 11-8n-12w, 5 miles north of Fort Cobb, is drilling below 17,260 feet. Crews successfully pulled 6 remaining drill collars from bottom of the hole and drilling operations were resumed May 5, less than 2 months after pipe became stuck 25 feet off bottom, at 17,211 feet. Pipe was cut 1500 feet off bottom, and the remainder washed over and recovered. There are no indications as to how deep the test will go, but many are of the opinion that the well may be taken to 20,000 feet. The equipment is reported capable of handling that much pipe.

Stephens County: Crews have killed Amerada Petroleum Corporation's Sledge 11, NE NE SE 19-1s-5w, in the West Velma field, and have started fishing to recover tools stuck on bottom. The well blew out a week ago and was estimated flowing 175 million cubic feet of gas per day. M. M. Kinley, wild well expert from Houston, was called in after other efforts to bring the well under control had failed. Kinley was able to kill the gasser with mud. Total depth is 2680 feet. Operators are expected to set a long string of 10-inch casing after the hole has been cleaned and conditioned.

Oklahoma County: An attempt is being made by Peppers Refining Company to extend production of the gas-distillate Witcher field ½ mile southeast. Dramack 1, CSW NW 28-13n-2w, was being tested in the Chimney Hill section of the Hunton lime below 6150 feet. A stain of oil and gas odor were recorded in the basal Pennsylvanian unconformity zone. If the Hunton lime fails to produce, the Oswego lime, topped at 5845 feet, will be tested.

Cities Service Oil Company has started Farley 5, SW NE NW 19-11n-2w, on the east side of the south end of the multiple-zoned Oklahoma City field, and the test is scheduled for 9000 feet, which is sufficient to penetrate the entire Arbuckle lime section of the structure, and contact the Reagan sand. Loffland Brothers Drilling Company of Tulsa holds contract. Location is believed to be on the highest point of the Arbuckle limestone structure, in which the field was discovered. It is a short distance west of the major fault that cuts the field on its east side.

Seminole County: Davon Oil Company has requested Oklahoma Corporation Commission to set a spacing and drilling pattern for the new Southeast Lima pool, which the company opened with Mee 1, NE NE SW 16-8n-7e, a Cromwell sand producer. Hearing has been set by the Commission for May 21 in Oklahoma City. The new area is south of the old Sancho pool, and 3 wells have been completed with a fourth drilling. All wells are on 10-acre spots with only 1 well to each 20 acres. The company asks spacing for the east half of Sec. 17, all of Sec. 16, the north half of Sec. 21, and the northeast quarter of 20-8n-7e.

Lincoln County: An oil and gas pool appears likely between the Laffoon and Petiquah pools. Sam King's Bledsoe 1, NW NE NW 11-13n-6e, was showing both oil and gas following shooting with nitroglycerine in the Prue sand (Pennsylvanian formation). Plug was drilled from casing set at 2924 feet, to total depth of 2932 feet, and the Prue shot with 20 quarts. The well was making an estimated 1 million cubic feet of gas with good show of oil while testing.

Cotton County: Although the fast play in Cotton County during the latter half of 1946 has quieted somewhat, shallow oil pools are still being found. Latest for the county, southwest of Randlett, was opened by Benton Ross Drilling Company and associates with Dugan 1, SW SE SW 5-5s-11w. The well is producing from the Pennsylvanian formation, main pay in the county, from 1577-90 feet, at the rate of approximately 125 barrels per day.

McClain County: One of the state's most closely-watched wildcats, Magnolia Petroleum Company's Mayer 1, CSW SE 35-8n-3w, north of Washington, had a good show of gas on a drill-stem test from 8185-203 feet, and operators were drilling ahead.

Garvin County: Max Pray and R. L. Bauman, operators in the productive Lindsay area, have brought in a well estimated good for 2400 barrels of oil daily. Frankenburg 1, CNW NE 7-4n-3w, flowed 150 barrels of oil per hour on a drill-stem test of the Bromide at 9984-10,064 feet, and made 30 million cubic feet of gas. Crews are now coming out of the hole with drill and the well probably will be completed from that zone. Crews used a 1380-foot water cushion and tool was opened 18 minutes. Water load was recovered in 13 minutes, gas showed in 15 minutes, and oil in 16 minutes.

Wells Completed in the United States in Week Ended May 3, 1947

Data preliminary and subject to revision. Revised and more complete data on all completions and exploration shown in monthly summaries published in last issue of each month.

State or District	FIELD COMPLETIONS: New Wells: Oil	Dist.	Gas	*Input	Dry	Total	Old Wells Deepened	EXPLORATORY COMPLETIONS: Oil	Dist.	Gas	Dry	Total	ALL COMPLETIONS: This Week	Last Week	This Week 1946
Arkansas	3				1	4		1			1	2	6	4	1
California	30		2			32	1				2	2	35	43	30
Colorado	2				1	3					1	1	4	2	1
Illinois	22				12	34					2	2	36	25	34
Indiana	2		1		2	5					6	6	11	7	13
Kansas	7		1		6	14	2	2			10	12	28	38	39
Kentucky					5	5							5	9	7
Louisiana	16		2		1	19		1	1		2	4	23	27	36
N. Louisiana	9		2		1	12		1			2	3	15	14	16
S. Louisiana	7					7			1			1	8	13	20
Michigan	2				2	4					2	2	6	9	12
Mississippi	4		1		2	7							7	9	2
Montana	2				1	3							3	2	1
New Mexico	2					2	3						5	10	7
New York	13			10		23							23	25	25
Ohio	12		8		9	29					1	1	30	22	11
Oklahoma	34		3		13	50	3	1		1	8	10	63	58	46
Pennsylvania	27		5	15		47							47	48	47
Texas	190	1	7	1	17	126	1	7	1	2	27	34	161	165	171
Districts:															
1—S. Central	1				1	2					4	4	6	8	4
2—Middle Gulf	10					10							10	14	1
3—Upper Gulf	7	1			2	10		1		1	4	6	16	17	16
4—L. Gulf-S.W.	14				2	16				1	4	5	21	23	32
5—E. Central	1					1		1				2	3	10	2
6—Northeast	3		2	1		6		1	1		2	5	11	2	19
7-B—N. Central	13		3		3	16		1			5	6	22	13	3
7-C—W. Central						4					1	1	5	3	4
8—West	25		1		4	31		1			2	3	34	34	30
9—North	2				5	25		2				2	27	37	61
10—Panhandle	5		1			6							6	4	9
West Virginia	2		13		3	18							18	14	10
Wyoming	3					3				1		1	4	6	2
Total U. S.	283	1	43	26	75	428	1	12	2	4	59	77	515	523	495

* Includes salt water disposal wells. [1] Middle Gulf included with Lower Gulf-S.W. [2] East Central included with Northeast. [3] North Central included with North. [4] West Central included with West.

• Kansas

Nine Wildcats Scheduled; Trapp Well Flows on Test

Nine wildcats staked; Trapp pool well flows 305 barrels on drill-stem test; Catherine South pool well pumping 300 barrels daily; wildcat near Jenne pool gets stains in Lansing lime.

The Conservation Division of the State Corporation Commission reported that 9 wildcats have been staked throughout the state, with drilling to begin shortly. Included in the list are wells in 7 counties: Crown Oil Company has staked Reif 1-B, SE SE SE 30-16s-12w, a mile southwest of the Beaver pool in Barton County; Mid-Plains Oil Company et al have staked Reidy 1, NE NW NW 15-32s-7e, 4 miles north of the Countryman pool in Cowley County; Derby Oil Company et al have announced Cox 1, SE SEc NW 33-9s-21w, 2 miles southwest of the Morel pool in Graham County. Two wildcats have been staked in Marion County. W. C. McBride, Inc.'s Dole Heirs 1, NW SE NW 7-19s-1e, is 4½ miles northwest of the Lehigh pool, and Joe Morine et al's Klenda 1, SE SE SE 15-19s-4e, is 3 miles southeast of the Propp pool, and 8 miles south of the Lost Springs pool. Aylward Production Company's latest venture is Yeagy 1, SW SW SW 35-9s-18w, 3 miles southeast of Paradise Creek pool in Rooks County. Great Lakes Carbone Company has staked Dirks 1, in SW SW SE 16-18s-18w, about 12 miles west of the Otis pool. Trego County has 2 new wildcats, including Continental Oil Company's Hillman 1, a stratigraphic test in NW NW SE 11-11s-22w, 6½ miles east of the Wakeeney pool, and J. M. Huber Corporation's Baugher 1-A, SE SE NW 23-12s-21w, a mile south of the new Cotton East pool.

Barton County: Black-Marshall Oil Company's Ainsworth 12, in the south sector of the Trapp pool, made an estimated 305 barrels of oil per day on a drill-stem test in the Arbuckle lime from 3393-401 feet. Operators will continue testing before completing.

Ellis County: The Catherine South pool has received a good pumping well by Cities Service Oil Company. Rome 1-B, SW NW SW 22-13s-17w, is making 307 barrels of oil per day from the Arbuckle lime, from 3526-31 feet. The company has staked Fee 1, NE SE SE 21-13s-17w.

Russell County: Oil stainings were logged in the Lansing lime at 3010 feet at Jones & Shelburn's Buhler 1, NE NE SW 26-15s-12w, 1½ miles southwest of the Jenne pool, but pipe became stuck at 3140 feet and crews were fishing. A show of gas was encountered in the Dodge lime, topped at 2938 feet.

• West Texas

Important Ellenburger Strike Discovers More Prolific Pay

Important Ellenburger discovery in Crane County logged more prolific pay before reaching water; Crockett County's Pennsylvanian discovery to drill through Ellenburger; San Andres strike in Terry County given 4 tests by Amerada; Devonian sector of TXL field expanded northwest and west; district's record-depth discovery in Winkler County has small yield.

Crane County: Gulf Oil Corporation's University 1-HH, 5-pay discovery for the University-Waddell prospect and capable of prolific flow of sweet crude with high lube content from the Ellenburger, was using testing tool at 11,015 feet, or 427 feet in Ellenburger, after encountering a small amount of formation water with oil flow. This wildcat was halted at 10,950 feet to cement 7-inch pipe 3 feet off bottom due to excessive bottom-hole pressure and danger of blowout. Plugs were drilled from casing and production test of open hole at 10,947-65 feet yielded 269 barrels of oil, 9 barrels of water, and 15 barrels of "solids" in 5 hours and 35 minutes after cleaning into pits for 97 minutes. Later test of open hole at 10,947-88 feet resulted in a flow of 277 barrels of 43.2-gravity oil, 2 barrels of water, and 12 barrels of "solids" after cleaning into pits for 26 minutes. A test at 10,984-11,000 feet returned 225 feet of slightly gas-cut mud without oil or water. An analysis of the water indicates that the main water-table has not been reached. Gulf is starting 2 tests and will drill out this important crude reserve as fast as pipe is made available.

Crockett County: Cities Service Oil Company, Plymouth Oil Company and Humble Oil & Refining Company's Owens 1-B, indicated flowing producer from the Crinoidal (Pennsylvanian), was deepening to explore the Ellenburger, and possibly continue to granite for geological information after flowing mud and sulphur water with trace of oil when tester was used at 7018 feet. Top of Ellenburger has been corrected to 6960 feet, although originally placed at 6780 feet by one of the owners, and 5-inch casing was cemented at 6770 feet. The Ellenburger is a good prospect for production elsewhere on this large structure.

Amerada Petroleum Corporation's University 1-C-T-A, C SE SW Sect. 23, Block 42, and 5 miles west by south of Block 39 prospect, was drilling Pennsylvanian at 7910 feet, having topped the Wolfcamp at 6130 feet with elevation of 2613 feet. Crockett County currently has 7 active Ellenburger wildcats outside the Block 39 area.

Winkler County: Amon G. Carter's Wight-Gulf, previously listed as a prospective oil discovery and at record-depth for production in the district, swabbed 5 barrels of fluid hourly, averaging 15 percent rotary mud and acid residue and the balance 43-gravity oil, after using 2000 gallons of mud acid in Ellenburger open hole at 12,265-359 feet. Regular acid treatment is expected to result in a small flowing well, unless water appears.

Declining reservoir pressure, accelerated water encroachment and the threat of a short flowing life for the structurally low and thin-pay Ellenburger producers in the Keystone field were factors behind the request of operators to reduce allowables. A special order of the Railroad Commission placed the field on an 18-producing day month so as to cut the allowable to 28,352 barrels daily. Operators have made progress towards a field-wide plan to try to curtail pressure decline by water injection on the east side of the structure.

Terry County: Amerada's Adair 1, San Andres discovery 6½ miles north by west of the Cedar Lake field, nearest production, recorded potential of 608 barrels of 33.1-gravity oil on swabbing test after using 9500 gallons of acid through perforations at 4850-925 feet. Gas volume in the oil zone is negligible, as is the case in the Cedar Lake 2200-acre field. This wildcat drilled to 4945 feet without reaching water. Amerada has spudded a west offset, and was starting Adair 2, Hicks 1 and Posey 1.

Hale County: Standard Oil Company of Texas and Humble's Hunt 1, C SE SE E. L. & RR. 6, Block CL, southwest offset to the Petersburg field's 6992-foot sweet crude discovery in Pennsylvanian, was drilling at 5210 feet and correlating 20 feet high on last marker. Stanolind's Stine 1, ¾ mile northwest of the discovery, also correlates high, and was drilling at 5990 feet. Should the latter produce in proportion to the discovery, Stanolind will undertake a big drilling program.

Ector County: Shell Oil Company's Cochran 1-A, C NE SE T&P 34, Block 46, T-1-N, and 1½ miles north of nearest Devonian production in the TXL field, flowed and swabbed 5 barrels of oil hourly on preliminary test after using 2000 gallons of acid in Devonian open hole at 7960-8150 feet. Retreatment with 5000 gallons of acid resulted in water breaking through, and the outpost will be acidized with prospects of a pumper. The intermediate acreage is considered proved for Devonian production, and will be drilled promptly.

Sinclair Prairie Oil Company's Slator 1, C NW SE T&P 1, Block 46, west edge of the TXL-Devonian area, flowed 1611 barrels of 40-gravity oil natural through 1-inch choke from open hole at 7982-8077 feet, requiring 3 offsets.

Phillips Petroleum Company's TXL 1-M, 4¼ miles west of a recent Devonian discovery in the Goldsmith field that was plugged back from Ellenburger, was drilling barren Waddell at 10,590 feet, correlating about 1000 feet low.

• Texas Panhandle

Denver Producing Disposes Of West Edmond Properties

Most of Denver Producing & Refining Company's holdings in the four-county West Edmond field of Oklahoma have been sold to Champlin Refining Company of Enid, Okla. Consideration was estimated at approximately $4 million.

Involved in the transaction were approximately 3000 productive acres on which there are 43 producers in the Hunton lime, and three producers in the Bartlesville sand zone, together with 560 acres of undeveloped leases.

Other properties operated in connection with the Denver's refinery north of Britton, Okla., were not involved, including pump stations and pipe lines. Several leases on the east side of the field in the so-called Bartlesville zone also were not included in the transaction.

Anton Firm Formed

Anton Oil Corporation has been organized with headquarters in the Electric Building, Fort Worth, and with plans to operate principally in Texas, New Mexico and Kansas. Roy L. Crawford has resigned as landman for Leland Fikes, Dallas, to join Anton as chief landman, and J. Roy McCoy resigned as geologist for Leland Fikes to take over the new firm's geological and production departments. George Etz and E. H. Robertson are in charge of operations.

• Texas Panhandle

Search for Pre-Permian Oil Production Gains in Volume

Search for pre-Permian production gains in volume; interest centers on Roberts County Ellenburger prospect; Wheeler County has semi-wildcat producer in shallow zone.

Roberts County: Phillips Petroleum Company's Campbell-Jenkie 1, SE SE SE I&GN Ry. 38, Block 2, projected Ellenburger test for the Anadarko basin sector of the district, was drilling lime, shale and granite-wash at 7640 feet. No shows were reported in drilling the Permian series.

Randall County: Big Bear Oil Company's Currie 1, C SW NE I&GN 57, Block 6, 6000-foot prospect, was drilling at 450 feet.

Sherman County: Phillips Petroleum Company's Burnhart-Troutman (Virginia) 1, C NW SE T&NO 234, Block 1-T, was drilling lime at 5895 feet on 6500-foot depth contract. While Shamrock Oil & Gas Corporation's Boothe 1, C NE Sect. 214, same area, was running intermediate string of pipe at 2166 feet, with contract to drill to 6000 feet. Oil showings developed by Phillips' Smith-Shirk 1 at the 5700-foot level, and the company's Norton-Elton 1, Hansford County, at 6118-38 feet brighten the outlook for pre-Permian production in the district. The latter is capable of swabbing 20 barrels of 35-gravity oil daily, But has been inactive for several months.

Wheeler County: Teci Production Company's O'Gorman 1-D, NE SE NE H&GN 98, Block 17, semi-wildcat, pumped 75 barrels of 37-gravity oil on 18-hour test from granite-wash at 2135-39 feet.

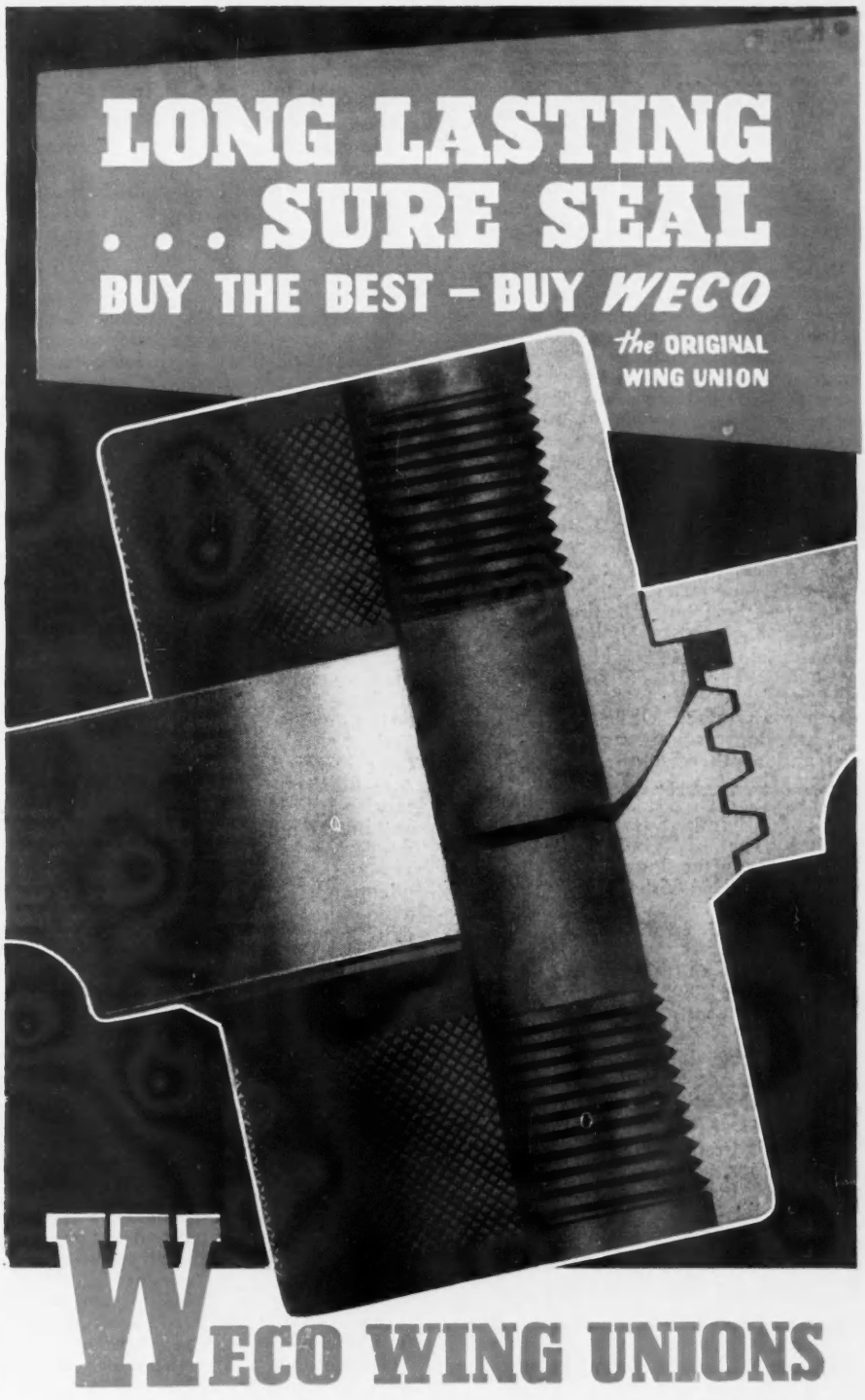
Williams Elected Head of Natural Gasoline Group

C. R. Williams, The Chicago Corporation, Corpus Christi, Texas, was elected president of the Natural Gasoline Association of America at the group's annual meeting in Dallas. Vice presidents included Henry Brown, Midland Gasoline Company, Houston; R. D. Gibbs, Union Oil Company, Los Angeles; James E. Pew, Sun Oil Company Philadelphia, and A. H. Weil, United Gas Pipe Line Company, Shreveport. W. F. Lowe, Tulsa, was reelected secretary-treasurer.

W. K. Warren, president, Warren Petroleum Corporation, was presented the Hanlon Award for meritorious service to the natural gasoline industry by J. H. Dunn of Amarillo, president, Shamrock Oil and Gas Corporation, and retiring president of the association.

Carbon Black Plants

WAA is offering for lease or sale six channel-type carbon black plants which cost the government $20,282,000. The plants, with a combined annual capacity of 126 million pounds, were operated during the war by Carbot Carbon Company at Guymon, Okla.; Charles Eneu Johnson and Company at Monument, N. M.; Panhandle Carbon Company at Eunice, N. M.; Columbian Carbon Company at Seagraves, Texas; United Carbon Company at Odessa, Texas, and Continental Carbon Company at Sunray, Texas.



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• North Texas

Fargo Field Ellenburger Pay To Be Developed Rapidly

Rapid development in store for prolific Ellenburger oil pay in Fargo field; prospective deep strikes in Clay County increased to 3; Montague County wildcat to set pumping unit.

Wilbarger County: Humble Oil & Refining Company's McCaleb 6, SE NE H&TC Ry. 34, Block 15, near the north end of the Fargo multi-pay field, confirmed a favorable drill-stem test of Ellenburger at 6248-345 feet in flowing 107.68 barrels the first hour and 102.16 barrels the second hour through ¾-inch tubing choke after drilling plugs from 5½-inch casing at 6242 feet. The gas-oil ratio was calculated at about 300/1, indicating water-drive as the source of the flow, while the gravity tested 41 degrees. Top of the Ellenburger correlates 49 feet high to the field's discovery ½ miles southeast. The latter swabbed 15 barrels of oil hourly from Ellenburger before plugging back to the shallowest of possibly 5 indicated pays. McCaleb 6 is 4 feet above the water table established by the field's initial test. Humble was starting an offset, while Amerada Petroleum Corporation was moving in for east and south offsets.

Clay County: L. T. Burns et al's Hughes 1, NE NE Sect. 9, Block 2, Clark & Plumb Survey and 4 miles north by east of Windthorst, was running tester after logging oil and gas showings at 5266-86 feet in Bend, topped at 5228 feet. This wildcat also had favorable test of Strawn sand at 4020-32 feet.

Continental Oil Company's Keen 1, NE NE Sect. 2698, TE&L Co. Survey and 3 miles south of the Joy multi-pay field, landed 5½-inch pipe at 5594 feet after plugging back from Ellenburger at 6518 feet. It was drilled as a core-test, and the prospective pay zone has not been released.

Magnolia Petroleum Company's Fisher 1, 2¼ miles south of the Scott pool, drilled 162 feet in Ellenburger to 6676 feet, and has plugged back to 6530 feet to try for a discovery pumper.

Montague County: Continental's Magee 1, C. A. Wright Survey, A-1052, wildcat failure in the Bend series, was installing pumping unit after swabbing 11 barrels of oil and 19 barrels of water on 8-hour test from Strawn perforations at 6018-38 feet.

Cooke County: Seitz-Comegys & Seitz, Inc.'s Bush-Standard 1, A. Livingston Survey A-598, and 3 miles east of Woodbine, was abandoned at 5013 feet in Ellenburger, topped at 4953 feet.

• East Texas

South Henderson Gas Field Test Is Flat With Discovery

Second test in South Henderson gas field correlates flat with discovery; Quitman field deep test drilling by junk; test under way of gas show in Cotton Valley in Fairfield area; Harrison County Travis Peak discovery completed.

Rusk County: Chicago Corporation et al's Morris 1, E. A. Smith survey, and a mile south of the Travis Peak gas-distillate discovery for the South Henderson field, was drilling at 6820 feet, and correlates flat with the discovery to indicate a large producing trea. The massive anhydrite was logged at 6143-375 feet, and the Young at 6477 feet with elevation 445 feet.

Wood County: Shell Oil Company's Goldsmith 12, projected Smackover test for the Quitman field, was drilling by junk at 10,875 feet, having stuck drill pipe on bottom at 11,172 feet and plugged back to 10,849 feet. The old hole is believed to be bottomed in Basal Cotton Valley, and no cuttings appeared with rotary returns in drilling the bottom 6 feet. This gave rise to reports that salt beds may have been reached, but an analysis of the drilling fluid revealed only nominal salt content. Salt plugs have been uncovered at comparatively shallow depth elsewhere in the county.

Freestone County: The Texas Company's White 1, Fairfield field Smackover lime prospect, was making production test for gas from Cotton Valley perforation at 11,291-305 feet after plugging back from lime at 14,331 feet. Liner was set at 11,417 feet to make the test.

Houston County: Magnolia Petroleum Company's Grounds 1, 6 miles southeast of Grapeland, was awaiting orders in Rodessa at 10,434 feet after taking sidewall cores of this zone. Nominal porosity and permeability registered in some of the recovered formation samples.

Henderson County: J. P. Owen et al's Rewer & Fulgram 1, J. A. Cavitt Survey and on the northeast edge of the Opelika field's band of flank oil production, was running pipe at 9157 feet after logging adequate oil pay in the Rodessa to make a flowing producer. The massive anhydrite was logged at 8450-690 feet with elevation 468 feet.

W. B. Hinton et al's Ryan-Magnolia 1, Santos Sylvester Survey, Tri-Cities field, entered the Travis Peak at 8468 feet with elevation of 442 feet and was drilling at 8745 feet. This area is attaining importance as a source of gas and distillate from the 7600-foot Bacon.

Smith County: Phillips Petroleum Company's Curry Opal 1, northeast offset to the Boynton field's Paluxy discovery, was due to set pipe after electrical formation survey established a thin section of good porosity and saturation at 7464 feet. It is bottomed at 7684 feet.

Harrison County: Arkansas Fuel Oil Company completed its new Travis Peak discovery, M. C. McCauley Senior 1, P. Dougherty Survey, flowing 55 barrels of oil daily through 5/32-inch choke. Gas oil ratio was gauged at 2000/1. Production is from 72 perforations at 6446-52 feet.

E. C. Johnston continues to test Edna Hood 1, Lucinda Wallace Survey, which is producing an unestimated amount of gas from Pettit perforations opposite 6162-82 feet, and Travis Peak perforations opposite 6276-94 feet.

Marion County: Magnolia Petroleum Company's Lassater field new pay test, Hall Estate 1, M. W. Moody Survey, continues to back up to test higher in the Travis Peak.

Oklahoma Map

The U. S. Geological Survey has released a new three-sheet map of the geology of the western part of the Ouachita Mountains of Oklahoma, an area described by officials as one of complex structure and stratigraphy, a knowledge of the geologic history of which is essential to an understanding of the geology of surrounding regions, including important oil field areas.

Copies of the map (Preliminary Map 66 of the Oil and Gas Investigation series) may be purchased at $1 each from Survey offices in Washington, Denver or Tulsa.

Price Fixing Bill Fails

The Oklahoma House of Representatives refused by a vote of 28 to 29 to advance a bill which would authorize the State Corporation Commission to fix the price of natural gas at the well head. An amendment by Rep. Don Baldwin of Anadarko, which would have denied to the Commission the right to fix any price lower than that being paid at the time of the passage of the bill failed, 12 to 17.

New Texas Map

A new oil and gas field map of West Texas and New Mexico has been published and put on sale by the Commercial Drafting Service, Houston. This map includes Railroad Commission Districts 7-C, 8, 10 and portions of 7-B, 9 and 1, and extends from Brownwood (99th Meridian) to El Paso and from top of Panhandle to north of Laredo. Information may be had from 1651 Colquitt St., Houston 6.

• South Central Texas

Atascosa County Test Fails; Jourdanton Gets Producer

Atascosa County Wildcat north of Campbellton abandoned; producer completed at Jourdanton; Magnolia coring Frio County wildcat.

Atascosa County: Eugene W. Gill's McAda 1, wildcat 3 miles north of Campbellton, has been abandoned at total depth of 5810 feet. Top of the Wilcox was called at 2950 feet and no shows were encountered in the hole. This dry hole is 187 northeast along the northwest line of Alfred A. Lee Survey from the east bank of the Atascosa River.

A producer at Jourdanton is Plymouth Oil Company's E. L. Powell 2, located 906½ feet west of Powell 1. This well was shut in during January after testing gas in a number of sands. Present completion is from perforations at 7383-89 feet where the well flowed on potential 15½ barrels of 44.4- gravity oil daily through ⅛-inch choke with tubing pressure 1100 pounds, casing pressure 1500 pounds, and gas-oil ratio 9003/1. Total depth is 7408 feet with 5½-inch casing set to 7396 feet.

Frio County: Magnolia Petroleum Company was coring Wm. McKinley 1, wildcat 6½ miles northeast of Pearsall. The test is presently coring in lime below 8500 feet. The Edwards lime was topped at 5605 feet. This test is scheduled to the 12,000-foot level.

• Southwest Texas—Lower Coast

Potential Run on Discovery West of Agua Dulce Field

Potential run on discovery west of Agua Dulce field; discovery east of Turkey Creek field shut in for storage; Wilcox test north of Eagle Hill gets

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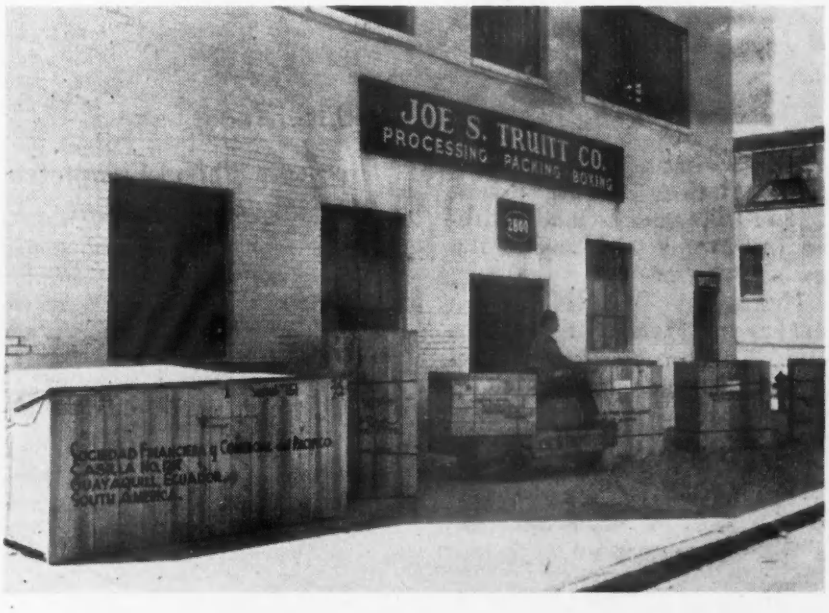

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gas-condensate show on drill-stem test; new producer finaled at Cam.

Nueces County: Mid-Continent Petroleum Corporation's John Sommer 1, discovery 1½ miles south of Agua Dulce townsite and 2½ miles west of Agua Dulce field, has been given potential gauge. The well flowed 122 barrels of 36-gravity oil daily through 3/16-inch choke with gas-oil ratio 432/1. Tubing pressure was 420 pounds and casing pressure 930 pounds. Total depth is 7008 feet with 5½-inch casing set to 6085 feet and perforated at 5982-88 feet for completion. This producer is in Sect. 24, Benton Pastr. subdivision, about three miles north of Stratton field.

Renwar Oil Corporation's W. B. McCampbell et al 1, wildcat about ⅓ mile east of Turkey Creek field, is a discovery. The well is shut in for storage after perforating at 5542-52 feet for completion. Total depth is 9015 feet and 5½-inch casing is set to 8650 feet. This well is 1700 feet east-northeast of the Carlos Oil Corporation's Vetters 1 well at Turkey Creek.

Duval County: The Atlantic Refining Company's J. R. Foster 1, wildcat ⅔ mile north of Eagle Hill field and a Wilcox test, is drilling below 7375 feet after getting a gas-condensate show on a drill-stem test. The test was made at 7027-40 feet in the upper Wilcox, and in 20 minutes developed 40 pounds working pressure through ¼-inch chokes top and bottom and recovered a 1000-foot water cushion and 300 feet of mud cut with gas and condensate. This test is in the J. R. Foster Survey 270, A-1642, about 10 miles north of Freer.

A new producer at Cam field is B. C. Graham & Cam Corporation's Rosa Benavides 6, 660 feet northeast of the No. 4 producer. On potential the well flowed 70 barrels of 39.3-gravity oil daily through 5/32-inch choke with tubing pressure 110 pounds, casing pressure 420 pounds, and gas-oil ratio 200/1. Total depth is 2694 feet with 5½-inch casing set on bottom and perforated at 2655-61 feet for completion.

AIME President to Be Honored On Southwest Tour This Month

Southwestern local sections of AIME will be hosts to Clyde Williams,, new president of the Institute, on his tour of the Southwest, May 12-17. He will be accompanied by Wilbur Judson, president of Texas Gulf Sulphur Company and former AIME vice president.

Clyde Williams

The Mid-Continent Section in Tulsa will honor the president with a luncheon May 13. The same day he will be honor guest at a dinner given by the Oklahoma City Section. In Dallas, he and Wilbur Judson will be guests of E. L. DeGolyer at a Petroleum Club reception May 14, and of the North Texas and East Texas Section at a banquet in the Adolphus Hotel. Williams and Judson will be honored by the Southwest Texas Section May 15 in Corpus Christi. The Gulf Coast Section will honor the AIME officers with a dinner in Houston May 16.

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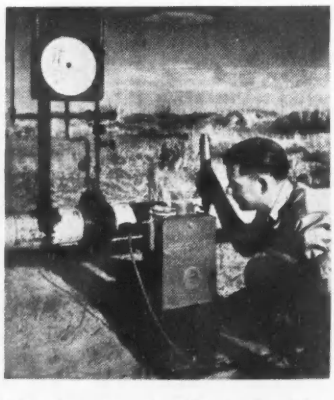

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• Middle Texas Coast

Gas-Condensate Area Tapped Southeast of Runge Townsite

Gas-condensate producing area discovered southeast of Runge townsite; Wilcox production discovered ½ mile northwest of old Dirks field; gas-condensate discovery in Wilcox at Hord's Creek completed; 2 drill-stem tests made with no oil shows in Victoria wildcat.

Karnes County: A gas-condensate discovery is W. E. Kinnear's E. Dittmer 1, 3 miles southeast of Runge townsite and 1½ miles northeast of Runge field. At completion the well flowed 1,027,000 cubic feet of gas and 48 barrels of condensate daily through 5/32-inch choke with tubing pressure 2300 pounds. Total depth is 7119 feet with 5½-inch casing set to 7006 feet and perforated for completion at 6764-69 feet in the Luling sand.

Bee County: Dirks Brothers and Tide Water Associated Oil Company's Page 1-B, ½ mile northwest of the old Dirks field, is a Wilcox zone discovery. On potential the well flowed 139 barrels of 36.8-gravity oil daily through 9/64-inch choke with tubing pressure 800 pounds and gas-oil ratio 1218/1. Total depth is 7438 feet with 5½-inch casing set on bottom and perforated at 7426-35 feet in the Mackhank sand for completion.

Goliad County: W. L. Goldston's Jennie Ray Kauffman 1, Wilcox discovery in the old Hord's Creek area, has been completed as a gas-condensate well. On completion the well flowed an estimated 3 to 5 million cubic feet of gas and 30 to 35 barrels of condensate daily on different chokes. Total depth is 8600 feet with completion made from perforations in the Luling sand of the Wilcox at 7900-20 feet.

Victoria County: Amerada Petroleum Corporation's Eliz. Mueller 1, wildcat 3 miles southeast of Mission Valley and 5 miles west of Nursery, was waiting on orders after making 2 drill-stem tests. Salt water was tested at 9825-45 feet and a test at 5730-45 feet developed a slight blow with no working pressure. When tool was pulled on the last test some gas-cut mud was recovered, but there was no show of oil.

• Upper Texas Coast

Discovery Being Completed For San Jacinto County

Discovery in San Jacinto County being completed; casing set in 3000-foot southeast extension at Chocolate Bayou; second producer being completed at North Cleveland; gas production at Hungerford extended ½ mile southwest; producer finaled on north edge of Sugar Valley production.

San Jacinto County: Mac Drilling Company was completing Cynthia Payne 1, discovery 4 miles south of Evergreen townsite in Vital Flores Survey, Abstract 14. On latest gauge the well flowed 108 barrels of fluid, 30 percent water and the remainder 36.8-gravity oil. Flowing pressure on tubing was 210 pounds. Total depth is 8260 feet with 5½-inch casing set to 7894 feet and perforated at 7682-702 feet for

completion. This test is on a farmout from Stanolind Oil & Gas Company.

Galveston County: A 3000-foot southeast extension for Chocolate Bayou field was indicated at Phillips Petroleum Company's Cosby 1, HT&B survey, Sect. 2. Total depth is 11,327 feet with 5½-inch casing set to 11,265 feet. Chocolate Bayou field, in eastern Brazoria County near the Galveston County line, produces from the Frio at the 9600-9700 and 11,400-500-foot levels.

Liberty County: Texana Petroleum Company's R. Lee Kempner 3 has been completed as the second producer in the new North Cleveland producing area. On potential the well flowed 112 barrels of 39.6-gravity oil daily through 7/64-inch choke with 950 pounds pressure equalized on tubing and casing. Total depth is 5789 feet with saturated sands topped at 5778 feet and perforated at 5784-86 feet for completion. This producer is on a 765-acre lease in Clayton Harper Survey, Abstract 209, and 990 feet east of the No. 1 well.

Wharton County: Coast Company's Hungerford Gas Unit 1 has extended gas production at Hungerford field ½ mile southwest. At completion the well flowed an estimated 1¼ million cubic feet of gas daily through 3/16-inch choke with 1140 pounds flowing pressure. Production is from perforations at 3041-76 feet in 5½-inch casing set to 3097 feet.

Matagorda County: Humble Oil & Refining Company's John F. Grant 7, has been completed as a producer on the north edge of Sugar Valley field. On initial gauge the well flowed 130 barrels of 34.4-gravity oil daily through 5/32-inch choke with 1300 pounds casing pressure and 450 pounds tubing pressure. Total depth is 9070 feet with 5½-inch casing set to 9068 feet and perforated for completion at 8996-9008 feet.

• South Louisiana

Gas-Condensate Production At Houma Extended North

Gas-condensate production at Houma extended 1½ miles north; casing set in Holmwood confirmation try; producer finaled at Pine Prairie; ½-mile north extension at Big Island field being completed; Bayou Boullion wildcat fails to flow on initial production try.

Terrebonne Parish: Union Oil Company of California's J. C. Dupont 1 has been completed as a 1½-mile north extension at Houma field. No gauge of production has been made but the well came in flowing gas and condensate through 3/16-inch choke with 4750 pounds pressure on tubing. Total depth is 12,074 feet with 5½-inch casing set 4 feet off bottom and perforated at 11,930-950 feet. The well is in 45-16s-17e.

Calcasieu Parish: Sohio Petroleum Company's Walker et al 1, confirmation test in the Holmwood field 2650 feet east of the discovery, has 7-inch casing set a foot off bottom in preparation for production tests. Total depth is 10,915 feet. Sohio's Farmers Land and Canal Company 2, discovery of the field, was completed early this year from Hackberry sands which showed saturation at 10,350-70 feet.

Evangeline Parish: A new producer for Pine Prairie field is Pan American Production Company's Schlicher-Thomas 2, 2-4s-1w. On latest test the well flowed 190 barrels of 39-gravity oil daily through 3/16-inch choke with 600

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pounds flowing pressure on tubing and gas-oil ratio 1200/1. Total depth is 8699 feet with completion in the Sparta at 8458-504 feet. A test of the Cockfield at 7396-414 feet flowed gas and condensate.

Rapides Parish: A ½-mile north extension to Tuscaloosa sand production at Big Island field is Union Producing Company et al's A. N. Floyd 1, 11-4n-2e. While cleaning, the well flowed 200 barrels of oil daily through 12/64-inch choke with tubing pressure of 1700 pounds and casing pressure of 1525 pounds. Seven-inch casing is set to 9784 feet and perforated at 9654-80 feet for completion.

Iberville Parish: Gulf Refining Company's Cotton et al 1-A, Bayou Boullion wildcat 2 miles southeast of production in 49-9s-2w, failed to flow on initial production try and was squeezed for another test. Total depth is 11,876 feet with 5½-inch casing set to 10,522 feet. Perforations were made at 10,332-54 and 10,374-86 feet for the tests.

Louisiana Allowable

The Conservation Commission has set Louisiana oil production during May at 455,472 barrels daily, an increase of 2661 barrels daily over April's allowable.

• North Louisiana

Hico-Knowles Field Given Half Mile East Extension

Hico-Knowles production extended ½ mile east; Winn deep test nears 11,000 feet; Madison distillate discovery sold.

Lincoln Parish: An extension to the Hico-Knowles field was made upon completion of Southwest Gas Producing Company's W. W. Farley 2, NW SW 24-20n-4w, ½ mile east of production. The initial gauge was an estimated open flow of 50 million cubic feet of gas daily accompanied by 30 barrels of distillate per million. Producing sand is the Bodcaw, perforated at 8400-32 and 8432-62 feet. This is the only active test in the field.

Winn Parish: Stanolind Oil & Gas Company's deep wildcat, Tremont Lumber Company 1, C NW SW 30-12n-1w, is drilling below 10,849 feet.

De Soto Parish: Skelly Oil Company's Thelma Nash 1, SW NE 20-12n-16w, north flank test in the Logansport gas area, which has had the field's first promising show of oil, was at 7474 feet, and repairing a cementing job on surface casing.

Madison Parish: Marr Producing Company has indicated intention to drill McEwee 1, 3500 feet from S/L, 2013 feet from W/L 6-15n-10e, as a Tuscaloosa wildcat. It is a location 3 miles north of Curtis Kinard's Ayer Timber 1, C NW SW SW 19-15n-10e, which has indicated a new gas-distillate discovery and was last reported flowing 6 barrels of distillate on a 2-hour test from the Tuscaloosa sand perforated opposite 5630-39 feet. No completion gauge has been attempted at the well, and its purchase was recently announced by Marine Oil Company.

Natchitoches Parish: J. F. Lent's E. L. Whatley 1, SW NE 20-10n-10w, wildcat which has been shut down several weeks for correlation of electrical log, has started to set casing for production test at 3268-3300 feet, where the best showing of oil was indicated. Considerable leasing has been done in the area.

• Arkansas

Spirit Lake Field Glen Rose Production Is Established

Glen Rose pay established in Spirit Lake field; Desha Basin wildcat test gets under way.

Lafayette County: Glen Rose production was definitely established in the Spirit Lake field with completion of Austin Stewart, H. G. Lewis, Jr., and Crow Production Company's H. Moore Estate A-2, C SE NW 13-16s-25w. The well was gauged flowing 336 barrels of 33-gravity oil per day through 7/32-inch choke. Production is through a series of perforations at 3740-50 feet, about 200 feet above the Massive Anhydrite. The new sand reservoir is believed to be small in size. Total depth is 4245 feet. Some porosity was logged in the Kilpatrick, topped at 4116 feet, but it was not tested.

Drew County: Curtis Kinard's A. S. Reinhart 1, C NW SE SW 15-12s-6w, Desha Basin wildcat, is drilling below 2266 feet. Production is still not established in the area, but, geologically, this test is considered the most advantageously situated of any so far drilled and is being watched with interest.

• Mississippi

Jones County Deep Prospect Continues Coring at 11,590

Jones County deep test continues coring after slight shows; Brookhaven extension try attempts to establish oil zone.

Jones County: Gulf Refining Company's L. L. Majors 1, SEc NE 29-6n-11w, which is seeking production from the 11,000-12,000-foot zone, continued with core tests below 11,590 feet. Having previously indicated excellent chances of making a commercial producer from the Eutaw and Tuscaloosa horizons below 7000 feet, the well cored sand with low porosity at 11,582 feet. Slight shows of brown oil were indicated in cores at 11,548-57 feet.

Jefferson County: The Ohio Oil Company's Hard Times Plantation 1, wildcat in NEc 35-8n-1w, is drilling below 9957 feet. Cores from 9795-9803 feet recovered sandy shale with no shows. In the Fayette field Humble Oil & Refining Company's M. R. Smith 2, 10-9n-1e was finally abandoned after the well died. The lower Tuscaloosa zone was perforated at 9675-710 feet and initially tested a flow of 9 barrels of oil per hour but driller was unable to establish permanent production.

Marion County: Humble's C. Tullos 1, wildcat in SWc 12-1n-18w, was drilling at 10,312 feet with no shows in the lower horizons. A drill-stem test at 10,102-23 feet recovered only mud and salt water with a slight blow. Humble was moving in rig for Ernest R. Ford 1, SEc 20-1n-17w, about 2 miles east of Tullos. The test probably is headed for the 10,000-foot zone. In the Baxterville field Gulf Refining Company was preparing to complete George Westerfield 1, SEc SW 1-7n-17w, for a good producer. Well was shut in after it flowed at the rate of 75 barrels of oil per day

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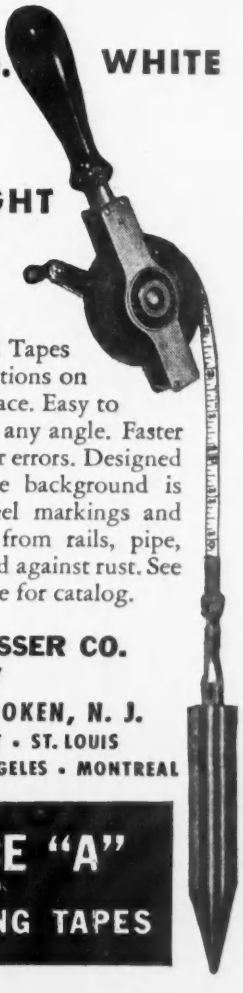

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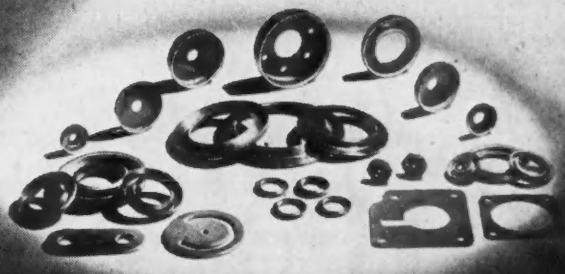

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Lincoln County: The California Company's John Smith 1, SEc 29-8n-7e, attempted north extension in Brookhaven, was having trouble in establishing oil zone. After a drill-stem test recovered fair amounts of oil, several sections of the Massive sand zone were reperforated at 10,520-58 feet. Well was swabbed and oil produced, but salt water content was 14 percent. Driller prepared to squeeze perforations for new test. The California Company-Reese Oliver's Johnny Case 1, NEc 33-8n-7e, made a duster in the same area. Sand was tested at 10,354-455 feet and the recovery was a small amount of gas-cut mud with no oil.

Adams County: The Pure Oil Company's L. S. Stanton 1, 11-6n-3w in the Carthage Point field was coring at 10,268 feet after drilling through potential productive section.

• Michigan

Promising Bay County Test Scheduled to Be Acidized

McClanahan and Reese's Knoodle 1, wildcat in SW SE SE 13-17n-3e, Bay County, carried 2600 feet of fluid in 36 hours after being deepened from 3027 to 3030 feet and is to be acidized. The well, located 3 miles south of an abandoned discovery well drilled a year ago by Sohio Petroleum Company, logged Dundee lime-dolomite at 2900 feet and showed oil saturation at 3024-27 feet. On bailer test, before casing had been set, it showed 600 feet of fluid, and after 5-inch casing was run it made a flow of 10 to 20 barrels of fluid.

Midland County: Reacidized with 3000 gallons, Collin and Whitney's O'Dell 1, S½ SE NW 7-15n-1w, wildcat 4 miles southwest of Edenville oil field, flowed and pumped from 31 to 43 barrels of oil on 6-hour test. Production is from Dundee pay at 3743-48 feet with hole bottomed at 3772 feet. It pumped about 10 barrels of oil per day after the first 1000-gallon treatment.

Newaygo County: Sun Oil Company's Purcell 1, NE NE SE 10-12n-13w, deep test in the Kimball Lake Traverse lime oil pool, was testing possible pay zone in the Monroe below 2873 feet.

• Illinois Basin

Illinois Extensioner Shows For Cypress Sand Production

Clay County, Illinois, extensioner shows for Cypress sand production; East Omaha pool extension try tests Tar Springs sand; Lawrence County wildcat swabs 20 barrels daily from Waltersburg sand.

Illinois

Evans and Barrow's Stanley 1, NW NE NE 35-5n-7e, ¾-mile north of the North Hoosier pool, Clay County, was drilling deeper after showing for Cypress sand production at 2555-80 feet. During a 1-hour drill-stem test the well made 95 feet of oil and oil-cut mud.

Gallatin County: R. B. Martin's Davis 1, NE NE SW 1-8s-8e, ½-mile east of the East Omaha pool, set 7-inch casing for test of Tar Springs sand at 2115-25 feet. A 2-hour drill-stem test showed 90 feet of oil and 90 feet of oil-cut mud.

White County: W. O. Allen's Brimble-Comb 1, SE 28-5s-10e, set pipe to a new horizon in the East Epworth pool. Casing was run to 2360-70 feet in the Tar Springs sand, which during a drill-stem test yielded 945 feet of oil.

Lawrence County: Fox and Fox's Boss 1, SE SE NW 11-2n-13w, 4 miles north of the Lancaster pool, swabbed 20 barrels of oil daily natural during tests of Waltersburg sand at 1775-85.

Mississippi Landmen Elect

R. E. Hart of Cities Service Oil Company was named president of the Mississippi Landmen's Association. Other officers: W. R. Beam, The Carter Oil Company, vice president; Ben F. Witt, Amerada Petroleum Corporation, secretary-treasurer. On the executive committee are M. McKay, Magnolia Petroleum Company; P. V. Hitt, Shell Oil Company; B. E. Gamble, Lion Oil Company; A. J. Viets, Sun Oil Company; and C. H. Fidler, Tide Water Associated Oil Company.

• Ohio

Gas Well in Ashland County Is Better Than Expected

Gas pool opened at Loudonville; Salt Creek deep test drilling on; Salt Creek test is failure; Brown shale tested in Meigs.

Ashland County: F. E. Barnhart's Emma Bowman 1, NW NW 10, Hanover township, is a better well than first believed. Clinton sand at 2882-94 feet made 900,000 cubic feet of gas nat-

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ural and when shut in after shot, it was making 2,575,000 with a rock pressure of 1200 pounds. The well found a small lens missed when the old Loudonville field was drilled.

Muskingum County: Industrial Gas Corporation's deep test on M. J. Wickam in Salt Creek township was drilling on after finding the St. Peter dry. Trenton limestone was logged at 5756 feet, St. Peter at 6617-20 feet, ad Black lime at 6720 feet. The Four-Way Oil and Gas Company stepped out nearly 2 miles northeast in an attempt to extend the Salt Creek field into Sect. 1, Salt Creek township. The Lena A. Pletcher 1, SW SW 1, had a show of gas in the Clinton, 4393-443 feet, and nothing in the Medina sand, 4505-13 feet. The Clinton was shot, but did not make enough gas to justify saving.

Meigs County: Ohio Fuel Gas Company's W. H. Ritchie 1, NE SW 1, Chester township, was drilled through the Brown shale to 3260 feet and shot, after which it rocked to 725 pounds with an open flow of 170,000 cubic feet. The well will be tested for some time as it is a wildcat 7 miles north of the nearest shale gas now produced, and may open up a large area.

• California

Second Producer Completed In Belgian Anticline Area

Second producer in Belgian Anticline area of Kern County makes discovery look impressive; second well staked in new field at West Edison; Northeast Coalinga extension off production, but plans made for second well; War Department schedules hearing on drilling offshore at Seal Beach.

Kern County: Completion of The Texas Company's second producer in the Belgian Anticline area indicates the company may have made a discovery of considerable importance. Westpet Unit One 46-29 in 29-30s-22e has been completed flowing 400 barrels of 32-gravity oil and 2 million cubic feet of gas through 15/64-inch choke. Flow pressure was 1075 pounds. Depth is 4773 feet and production is from a gun-perforated interval in Oceanic sand at 4720-48 feet. The well is about ½-mile west of Texas' Westpet 1 discovery which was drilled into a gas cap at 5125 feet and completed in October flowing 10 million cubic feet of gas. This well is shut in.

In the West Edison area, Union Oil Company has staked Smith 63 a location northwest of its recent discovery well, Porter 74 in 28-30s-29e. The latter was completed last month from the Santa Margarita formation pumping 66 barrels of 23-gravity oil.

Solano County: Shell Oil Company has filed a location for a westerly outpost test of the Winters gas field. Szekeres 1 will be drilled in 19-8n-1e on a stepout location from the company's recent completion, Winters Unit 4-1, which has been brought in flowing 9 million cubic feet through a 28/64-inch choke.

Shell's recent completion, Wagenet 2 in the Kirby Hills gas field bettered its previous production rate when it made 17½ million cubic feet through 1-inch choke. This is the state's largest gas well in many months.

Fresno County: E. W. Pauley will drill an extension north of the Raisin City field. Location has been staked for N.C.C. 78 in 11n-15s-17e. The well will be taken to the Eocene.

Sharples Oil Corporation's recent outpost discovery, Hyde 1, north of the Northeast Coalinga extension, is off production due to plugged perforations following a squeeze job. Operator was reperforating and should be able to put the well back on production. Preparations were being made to drill a second well ¼-mile northwest.

Los Angeles County: Showings have been reported on the ditch at Shell's Dolley 2 outpost on the north flank of the Long Beach field. The area being drilled is well regarded and would have been tested heretofore except for restrictions imposed by the landowner. The well is drilling below 10,150 feet.

Orange County: The War Department has scheduled a public hearing at Santa Ana on May 18 for consideration of an application by Marine Exploration Company for a permit to construct an island 8100 feet offshore from the City of Seal Beach, Orange County, for drilling 3 tests. The company holds a state lease for the offshore development. To the northwest, in the Long Beach Harbar area, Los Angeles County, the city of Long Beach is considering tunneling out beneath the sea bottom for drill sites. Bids for exploration of the offshore deposits by tunneling will be sought from local oil companies.

Ventura County: W. H. Geis was completing Robertson 1 as an Eocene producer in the Bardsdale field. The well would only flow by heads and pumping equipment was being installed. Total depth is 5887 feet. Eocene production is not new in this field, but there has been little development in recent years.

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Fig. 103

Front View

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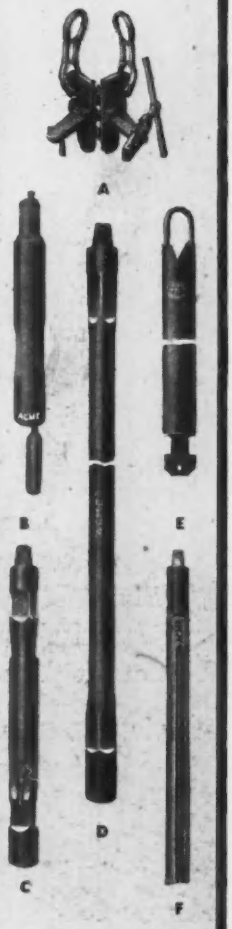

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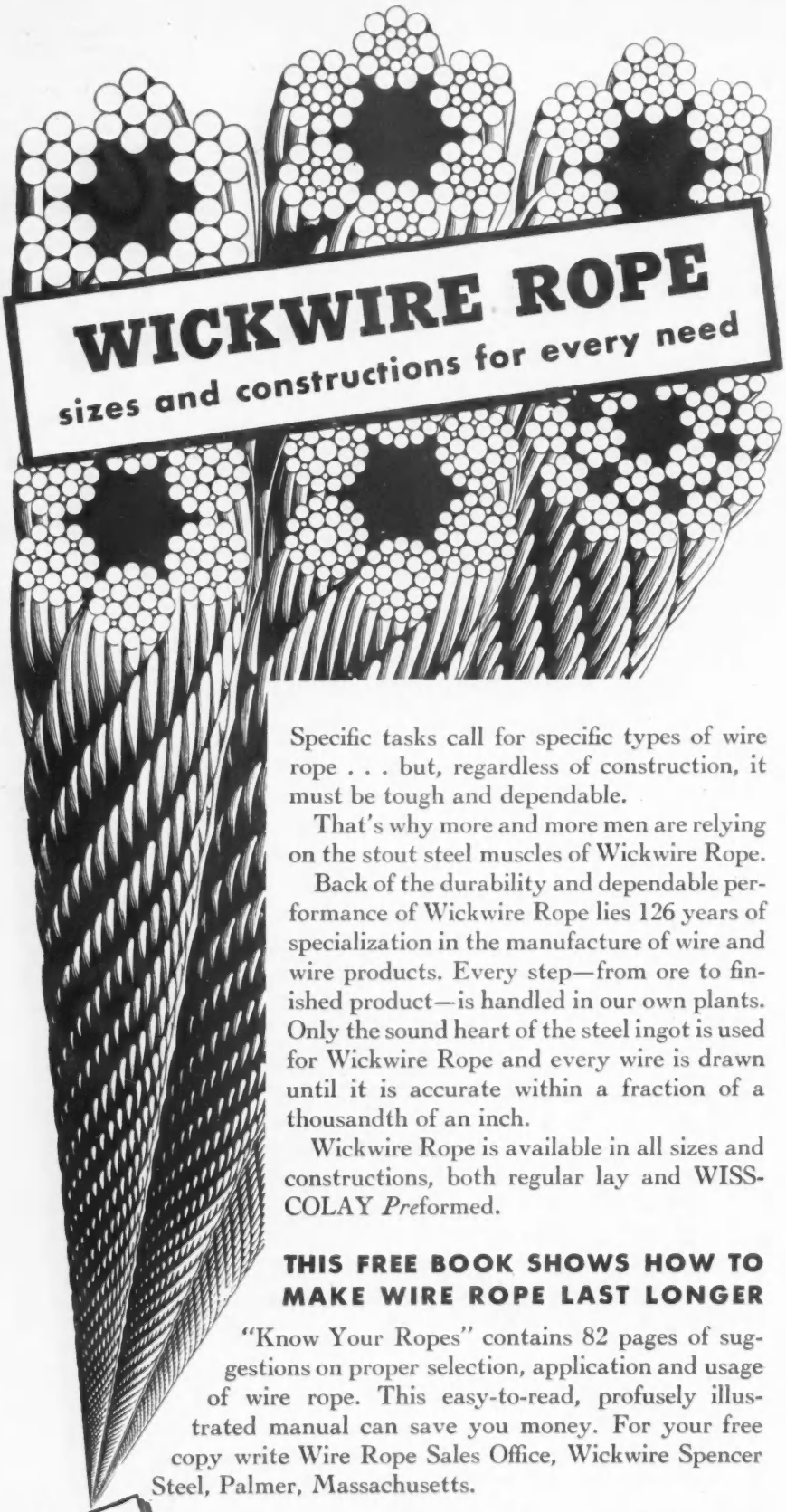

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CF&I

• Rocky Mountain Area

Carbon County, Wyoming, Test Completed as Gas Discovery

Carbon County, Wyoming, test completed as small gas discovery; Muddy sand producer completed in Crooks Gap field; Natrona County wildcat finds Third Frontier at 3641; depth record for region established; Powder Wash field, Colorado, gets east extension.

Wyoming

Kerr-McGee and Phillips Petroleum Companies have completed Unit 1, C SE SE 10-12n-92w, Carbon County, on the Baggs structure along the Wyoming-Colorado line, for a small gas discovery. The test was drilled to 9512 feet, total depth, in the Mancos shale, and was plugged back for a series of tests in the Fort Union. The gas, estimated at only ½ million cubic feet open flow daily, is produced from thin, lenticular sands between 3771-81, 3322-30 and 3449-60 feet in the Fort Union formation. The well will not be produced as there is no pipe line outlet, but completion probably will validate unit requirements.

Fremont County: Sinclair Wyoming Oil Company has completed the first Muddy sand producer in the Crooks Gap field, south of Riverton. The well was a dual completion, making 1542 barrels of oil daily from the Muddy and Lakota sands through perforations between 4955-67 and 5105-210 feet. The well is Unit 7, NW NW NE 13-28n-93w, a ½-mile north extension. The Crooks Gap field was discovered in 1944 and Sinclair now has six producers in the Lakota formation. Unit 6, a mile south of the recent completion, was the first to show oil in the Muddy sand on drill-stem test.

Natrona County: British American Oil Producing Company's wildcat at Natrona found the Third Frontier at 3641 feet but on drill-stem test recovered only a small amount of mud, with no water. The Third Frontier was the principal objective of the test but drilling continued for a check of the Sundance at around 4000 feet. The well is Unit 1, NE NE SW 27-36n-83w.

Sweetwater and Uinta Counties: Mountain Fuel Supply Company's Unit 3, NE SW NE 12-16n-113w, 1 mile west of the discovery well in the Church Buttes field, has established a new depth record for the Rocky Mountain region. This well it at 12,950 feet, total depth, and 7-inch casing has been run to 12,944 feet for a test of the Dakota horizon. Unit 2, NE NE NE 22-17n-112w, also was reported to be in the Dakota horizon and was running casing to 12,459 feet, total depth. With the completion of these two tests, and the release of information by Mountain Fuel, much more will be known about the large Basin structure discovered by seismic methods. The discovery well, completed a year ago, still has not been completely tested and has been shut in since completion. Estimates of production have ranged as high as 100 million cubic feet of gas daily with a large volume of condensate.

Washakie County: In the Worland field, The Pure Oil Company's Unit 5, C SW NW 21-48n-92w, an extension test 1 mile southeast of production, has had excellent recoveries on drill-stem tests of the Frontier formation at

around 7250 feet. On test at 7283-301 feet the recovery was an estimated 4 million cubic feet of gas with 120 feet of 52-gravity condensate. Gas and condensate have been tested in the 3 previous completions in the field but this horizon is not produced in any wells at the present time. The Worland field was a discovery in the Embar formation in 1946 and now produces at the rate of 700 barrels of 40-gravity oil daily.

Colorado

Sprecher Drilling Company's east extension to the Powder Wash field, Moffat County, was being completed as a producer flowing approximately 10 barrels of oil per hour. The well is Government 1, SW SW NW 34-12n-97w, and is being drilled on a Sinclair Wyoming farmout. The test went to 5225 feet, total depth, but production is from a sand in the Wasatch between 4596-620 feet. Powder Wash was a discovery in 1936 and produces both gas and oil from lenticular Tertiary sands.

Field Conference Planned in Big Horn Basin, August 4-8

A field conference August 4-8 in the Big Horn Basin, Wyoming, is to be sponsored by the Wyoming Geological Association, the Yellowstone-Big Horn Research Association and the University of Wyoming.

Members of the AAPG and the Geological Society of America are being invited to participate in the conference, which will begin with a two-day trip through the southern and eastern part of the Big Horn Basin August 5-6 under the leadership of the Wyoming association. The last two days of the conference will be under the leadership of the Yellowstone-Big Horn Research Association and the University of Wyoming.

The field conference will be limited to 400. Information may be secured from W. S. Knouse, Tide Water Associated Oil Company, Box 1708, Casper.

• Canada

Leduc 2 Is Indicated Strike In Zone Below Initial Find

An oil and gas discovery in Devonian limestone 200 feet below the horizon which yielded the Leduc discovery in February was indicated last week at Imperial Oil Ltd.'s Leduc 2 wildcat.

The well broke into porosity at 5368 feet and on drill-stem test May 7 it began making gas at the rate of 1 million cubic feet daily 3 minutes after the tester opened, followed by a spray of oil. The test was halted after 25 minutes. Pipe was pulled and found to contain 300 feet of 38.8-gravity oil with no sign of water.

The well is 1¼ miles southwest and downflank from Imperial's Leduc 1, which blew in with 1000 barrels initial flow from Devonian lime at 5029-66 feet. The corresponding zone at No. 2 showed oil and gas but porosity was poorly developed. Imperial Leduc 3, located 2 miles northeast of No. 1, is now below 5016 feet with varying slight porosity from 4925 feet. A series of drill-stem tests at 10 to 20-foot intervals showed a small gas flow plus small oil-cut mud recovery. The latest test at 5006 feet yielded a stand of free oil. The zone corresponds to the discovery horizon of Leduc 1.

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NOTICES

■ ATTENTION — FISHERMEN - HUNTERS! Reservations for summer fishing parties and fall hunting parties are now being booked in the heart of the Jackson Hole country of Wyoming. Superior trout fishing, big game hunting, moose, grizzly and elk. Pack trips, etc. Landing facilities. Write Col. Marshall Purvis, C Heart C Ranch, Bondurant, Wyoming.

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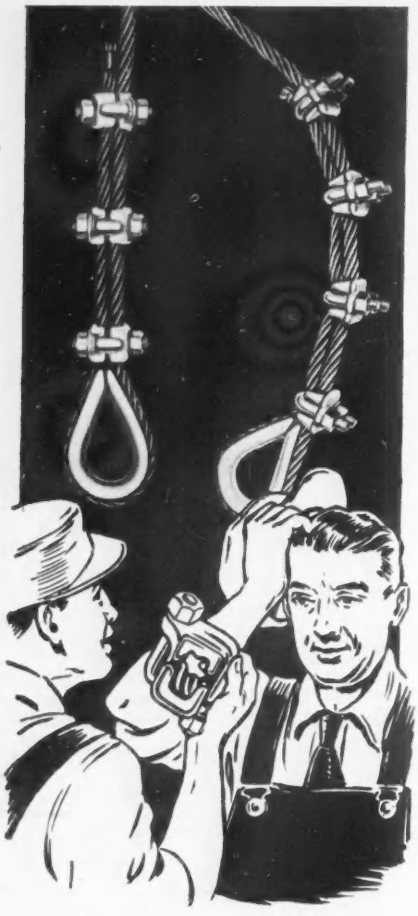

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CALIFORNIA WILDCATS

Kern County: Independent Exploration Co.'s Olcese 2, 16-28s-29e, Round Mt. area, Vedder 1956, abnd 5-2-47 at 1963.

Independent Exploration Co. and Bandini Pet. Co.'s KCL-A 11-10, 10-10n-20w, Pleite area, abnd 4-26-47 at 5538.

COLORADO OUTPOST

Rio Blanco County—Rangely Field: Idaho-Sharples-Wasatch's M. B. Larson 1-26, c se sw 26-2n-103w, Weber 6740, El. 5596, abnd 4-22-47 at 6802.

ILLINOIS WILDCATS

Edwards County: Magnolia's Lankford 1, ne nw sw 3-1s-14w, abnd 3069.

George & Wrather's Townsend 1, 30-2n-11w, abnd 2107.

INDIANA WILDCATS

Dubois County: Claude Tressler et al's Himsel 1, se nw ne 2-1s-6w, abnd 992.

Porter County: Walter Eglske's Fee 1, sw ne 9-36n-5w, abnd 1115.

Posey County: Superior's Lowe 1, nw 12-4s-12w, abnd 2625.

G. E. Nelson's Rickens 1, ne ne nw 12-5s-14w, abnd 325.

Vigo County: Isaacson Oil Co.'s Hillman 1, nw se ne 14-10n-11w, abnd 2304.

Collins Brothers' Kendall 1, nw nw nw 27-10n-9w, abnd 2209.

KANSAS WILDCATS

Barton County: Keener Oil Co.'s Tucker 1, nw nw ne 33-20s-13w, abnd 3586.

Butler County: Adair Oil Co.'s Guyot 1, sw se se 5-29s-5e, abnd 2882.

Veeder Supply Co.'s Whitbeck 1, sw nw nw 27-29s-5e, abnd 2883.

Ellis County: Bay Pet. Co. et al's McCombs 1-B, nw nw sw 11-11s-17w, abnd 3400.

Brunson & Adair et al's Schmidt 1, ne ne sw 22-15s-17w, abnd 3585.

Kingman County: Earl F. Wakefield's Albritten 1, ne ne ne 35-28s-10w, abnd 4690.

Rooks County: Derby & Wilcox's Stamper 1, nw nw sw 28-8s-17w, abnd 3466.

Herndon Drlg. Co.'s Overholzer 1, nw nw nw 31-9s-16w, abnd 3737.

Stafford County: Three-Way Drlg. Co. et al's Witt 1, cn½ nw sw 30-22s-12w, abnd 3785.

Sumner County: Falcon-Seaboard Drlg. Co.'s Stewart 1, ne se se 18-31s-1e, abnd 4164.

OHIO WILDCAT

Muskingum County: Four Way O&G Co.'s Lena A. Pletcher 1, sw sw 1, Salt Creek, Medina 4505, abnd 4-22-47 at 4521.

OKLAHOMA WILDCATS

Cotton County: R. E. Barbre's Cassidy 1, nw nw se 30-3s-11w, abnd 2006.

Snoddy Brothers' Keeter 1, nw nw se 22-4s-10w, abnd 2005.

Gandy Oil Co. et al's Johnson 1, nw nw nw 5s-10w, abnd 1896.

Garvin County: Lookabaugh Oil Co. et al's Dulworth 1, ne sw se 34-4n-3e, abnd 3069.

Jefferson County: R. V. Dillard's Kennedy 1, se se nw 31-5s-8w, abnd 2001.

Logan County: Ray P. Diehl's Rutlege 1, c ne nw 8-17n-3w, abnd 4957.

Noble County: Pepper Ref. Co.'s Neely 1, ne ne se 28-23n-1w, abnd 4710.

Tillman County: R. L. Wheelock's Fergueson 1, nw ne 5-4s-17w, abnd 3586.

WEST TEXAS WILDCATS

Gaines County: Jergins Oil Co.'s Parmer County-Fuhrman 1, 440 out sec lab 19, Lge 316, Parmer CSL sur, elev 3093, anhydrite 2147, abnd 4-28-47 at 5504.

Howard County: C. W. Guthrie et al's TXL 1-B, nw nw sw T&P 43, blk 30, T-1-S, elev 2257, San Andres 1795, abnd 5-3-47 at 2925.

WEST CENTRAL TEXAS WILDCAT

Upton County: R. H. Svendsen et al's Atlantic Ref. Co. 1, ne ne se MK&T Ry. 1, blk 1, abnd 5-5-47 at 1897.

NORTH CENTRAL TEXAS WILDCATS

Callahan County: Standard of Kansas' Murphy 1, 340 wel 3100 nsl Mrs. G. D. Spottswood sur, elev 1913, Home Creek 1437, Ranger 1565, Adams Branch 1700, Palo Pinto 2055, Bend 3070, Ellenburger 4014, Cambrian 4705, Hickory 5106, abnd 4-28-47 at 5131.

Haskell County: Anderson-Prichard Oil Corp's Stamps 1, 2750 ewl 3600 snl D. I. Woodleif sur 122, elev 1539, abnd 4-26-47 at 5000.

Fisher County: Ed. C. Lawson-British-American's Hitchcock 1, 330 s 1140 e of nwc of T. Ayers sur 324, Valera 1920, base Sedwick 2730, Dothan 2800-40, Noodle Creek 2913, Saddle Creek 3110, Flippen 3163, abnd 4-30-47 at 4751.

Jones County: Exploration Drlg. Co.-Western Oil Dev. Co.'s Maynard 1, 330 out sec sbdn 1, Goliad CSL sur 358, elev 1821, Wolfcamp 1998, Flippen 2829, Hope 2997, Swastika 3211, Adams Branch 3892, Palo Pinto 4340, abnd 4-21-47 at 4498.

Taylor County: G. H. Brodie-Carl Hovgard et al's Meeks 1, 330 ewl 2100 nsl T&P Ry. 63, blk 19, elev 1951, Flippen 2810, base Gunsight 3130, Swastika 3215, Reef 3810, abnd 4-26-47 at 3975.

EAST CENTRAL TEXAS WILDCAT

Denton County: Farris-Carter & Geo. B. McCamey's Schindler 1, 990 nsl 1650 wel of P. Gass sur, Pennsylvanian 1815, abnd 4-10-47 at 3322.

NORTHEAST TEXAS WILDCATS

Rusk County: Tex Harvey Oil Co.'s Coleman 2, 1520 wel 4700 snl Mary Able sur, elev 342, Pecan 3279-3612, Austin 4060-4257, Woodbine 4258, abnd 4-27-47 at 4365.

Wood County: R. J. Caraway et al's Mullinax-Martin 1, 527 ewl 9450 fr m/s/sl Mary Polk sur, elev 471, Pecan 3080-3390, Austin 4605-4754, Woodbine 5310, Georgetown 6150, Ft. Worth 6987, Goodland 7658, Paluxy 7774, abnd 4-28-47 at 8063.

NORTHEAST TEXAS NEW PAY TEST

Wood County — Hawkins Field: Humble's Little Sandy Club 1, 2750 nsl 5960 ewl Edw. Wideman sur, elev 318, Pecan 3147-3350, Austin 4310-4499, Woodbine 4735, Goodland 6637, Paluxy 6697, Glen Rose 7123, massive anhydrite 8560-8610, Travis Peak 9314, abnd 4-29-47 at 9512.

SOUTH CENTRAL TEXAS WILDCATS

Atascosa County: H. R. Smith et al's W. T. Hurt 1-A, 1930 fr sel 1400 fr nel K. Bryan sur 143, 1½ mi sw Weigang fld, 576-ac lse, abnd 4-20-47 at 3850.

Bastrop County: General Crude Oil Co.'s Earl Callahan 1, 330 fr m sly/el&sly/swl 301-ac lse, L. Leverence & Chas. S. Smith sur, chalk 2710, Edward li 3375, abnd 4-25-47 at 3418.

Milam County: C. E. Whitehead's Richard Ellison 2, 3000 fr nwl 16,200 fr swl L. Taylor sur, abnd 4-20-47 at 3262.

Williamson County: R. Clark's C. Kootz 1, 4700 ne alg sel P. Zarza sur fr its sec th 500 se at ra, in Francis Bradley sur, abnd 3-31-47 at 922.

SOUTHWEST TEXAS-LOWER COAST WILDCATS

Hidalgo County: Texas Co.'s A. E. Guerra et al 1, 29,500 fr sl 25,000 fr wl Sta. Anita (M. Gomez) Gr, abnd 4-24-47 at 9000.

Jim Hogg County: Cecil Hagen-Mills Bennett's M. Garza Est. 2, 330 fr ne&sel blk 2, sur 39, Alworth fld area, abnd 4-24-47 at 2084.

Nueces County: Skelly's W. C. Rivers 1, 467 fr el 853 fr sl 240-ac lse, w½ sect 26, 1½ mi w Agua Dulce fld, abnd 4-23-47 at 7358.

Starr County: Daubert & Achning's John J. Cox 1, 467 fr n&wl sur 547 on n 320-ac, ¾ mi se N. Rincon prod, abnd 4-25-47 at 6006.

UPPER TEXAS COAST WILDCATS

Brazoria County: General Crude Oil Co.'s Belle H. Wisdom 9, 330 fr sel 125 fr sw; blk 53, Abraham Darst sur, lot "A," Damon Mound area, abnd 4-25-47 at 3865.

Ft. Bend County: Jack W. Frazier's A. P. George 1, 1000 fr w shore Smithers Lake, 20-ac unit out of 830-ac lse, 3¼ mi w of N. Thompson fld, abnd 4-30-47 at 5583.

Montgomery County: W. F. Newton's Montgomery County 1, 330 nw of nwl H. O. Howell 50-ac tr, J. Montgomery sur, abnd 4-23-47 at 5039.

San Jacinto County: Phil Harris & Alice Faye's Hill Estate 1, 3100 e of el de la Garza sur, 1000 n of Thos. Webb sur, 160-ac lse on Vital Flores sur, abnd 4-24-47 at 8092.

Shale Plant Dedication

The Bureau of Mines oil shale demonstration plant on the Naval Oil Shale Reserves near Rifle, Colo., will be dedicated May 17. Boyd Guthrie, supervising engineer of the plant, will be master of ceremonies and speakers include Under Secretary Oscar L. Chapman, Congressman R. F. Rockwell of Colorado; Commodore William G. Greenman, director, Naval Petroleum Reserves; F. C. Merriell, secretary, Colorado River Water Conservation District, and R. R. Sayers, director, Bureau of Mines.

Speakers at a banquet to be held at night in Glenwood Springs will be Colorado's Governor William Lee Knous, Senator Joseph C. O'Mahoney of Wyoming, and A. R. Olpin, president, University of Utah.

Natural Gas Regulation

The controversial issues in the control and regulation of natural gas are presented by Dr. Frederick F. Blachly and Dr. Miriam E. Oatman in their new book, "Natural Gas and the Public Interest." Federal interpretation of the Natural Gas Act and the Federal Power Commission have focused much interest on this subject.

In this book, the basic factors involved have been carefully weighed and the background of the problem presented. Supply, rate of consumption, reserves, mechanics of oil and gas production, and price of natural gas are considered. Other basic factors concerned in regulation are the public interest and the competitive practices of the producing and consuming interests.

Detailed study is presented of state regulation and control of the natural gas industry and why regulation was first inaugurated. The authors have examined state and federal laws of natural gas regulation and report on the government's interest in the situation and what has been done since 1925.

Two chapters are devoted to the pros and cons on regulation and control of the natural gas industry. In these two important chapters, the factors which divide the forces of free enterprise and government regulation are carefully defined. Social, economic and political aspects of both points of view are discussed. Conclusions and recommendations of the authors are contained in the final part of the book.

Containing 159 pages, the book is priced at $1. Published by Granite Press, 1025 Connecticut Ave. N. W., Washington 6, D. C.

Southeastern Fields

The second volume of "1945 Reference Report on Certain Oil and Gas Fields of North Louisiana, South Arkansas, Mississippi and Alabama," has been published by the Shreveport Geological Society. The first volume contained in addition to the 55 fields, an index map of oil and gas fields and salt domes in East Texas, North Louisiana, Mississippi and Alabama, two stratigraphic sections, and one structural section.

The second volume includes in addition to Delhi, West Delhi and 24 other fields, ten stratigraphic sections, a bibliography of oil and gas fields in South Arkansas, North Louisiana and Mississippi plus three new papers on these regions by prominent geologists.

Prices are $12.50 for the first volume and $10 for the second volume.

Rocky Mountain Operations

"Resume of Oil & Gas Operations in the Rocky Mountain Region," 17th annual edition, has been published by Petroleum Information, Denver. Containing 175 pages of factual material, maps, and statistical reports, this book also presents a general review of activities in the Rocky Mountain Region during 1946.

Copies may be obtained from Petroleum Information, Continental Oil Building, Denver. Price, $10.

Diesel Fuel Oils

A new American Society for Testing Materials publication presents eight nontechnical papers discussing diesel fuel problems and conclusions of leaders representing consumers and producers of diesel fuels and manufacturers of diesel equipment. The papers and authors are as follows:

"Introduction," E. W. Ison; "Postwar Military Trends," G. H. Vogel; "Diesel Fuel in Railroad Operation," W. W. Kelly; "Diesel Power in Bus Operation," F. T. Ward; "Increasing Diesel Horsepower vs. Diesel Fuel Supply," Robert H. Morse, Jr.; "Diesel Engine and Burner Distillate Fuels," John C. Day; "East Coast Distillate Fuel Production," Joseph E. Keller; "Distillate Fuels—West Coast," A. G. Marshall.

The 44-page publication can be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $1 per copy.

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AMERICAN RADIAL ROLLER BEARINGS
For nearly every application where the load is radial you'll find an AMERICAN RADIAL ROLLER BEARING to meet your requirements. Engineered to exacting standards, precision tested, specially designed for smooth, reliable operation under tremendous loads, AMERICAN RADIAL ROLLER BEARINGS function flawlessly in the heaviest equipment built and under the most rigorous operating conditions encountered in any industry.
AMERICAN RADIAL ROLLER BEARINGS come in 5 styles, 4 S.A.E. series and 85 sizes. Special designs to order are also available. Our engineers will cooperate with your own technical staff on all your roller bearing problems.
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Pacific Coast Office:
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AMERICAN
Heavy-Duty ROLLER BEARINGS

O. D. Story of Shell Oil Company's regional staff, Houston, heads the firm's purchasing stores for exploration and production activities east of the Rockies. Under his authority will be all purchasing-stores activities in the newly-created area offices at Midland, Texas; New Orleans, Tulsa and Houston. **H. A. Shanks** will head the division at Midland, **A. J. Clark** at New Orleans, **C. G. McLaren** at Tulsa, and **E. J. Ehinger** at Houston.

O. D. Story

James Worsdall, previously with the Shell group in Trinidad and Mexico, has returned to Latin America and has established headquarters at the Hotel Granada in Maracaibo. He served in World War II in the Middle East as a major in the Royal Engineers. He expects to operate in Maracaibo as an engineer and contractor.

M. G. Frey heads The California Company's new Rocky Mountain Division offices at Casper, Wyo.

Max E. Stansbury, formerly in the legal department of the Ponca City offices of the Continental Oil Company, has joined the West Cost division of the company as counsel. He will handle contracts and legal work relating to land, leasing, etc. During the war Stansbury was engaged in work connected with the development of atomic energy.

E. G. Gaylord has been elected vice president and director of California Research Corporation, Standard Oil Company of California subsidiary, and will head a new division formed to coordinate and expand the company's oil field research. Activities of the new branch will embrace laboratory and research services for the various oil field operations of Standard, its subsidiaries and affiliates, including geological, geophysical, drilling, producing and surface processing work. Laboratories will be at La Habra, Calif., where a new structure is under construction. Gaylord started in the oil business as a roustabout, served ten years in the engineering and geology departments of Pacific Oil Company, and was placed in charge of development in 1921. He joined Standard in 1926 at the time of its merger with Pacific and became chief petroleum engineer.

E. G. Gaylord

Paul B. Fahle is district geologist and head of the new office opened in Shreveport by Plymouth Oil Company. **A. B. Cox** is geological scout and **R. E. Rogers** will be head of the land department.

H. P. Carroll, operating manager, and **E. L. Henderson,** assistant operating manager, both of Houston, were named vice presidents of United Gas Corporation.

J. R. (Dick) Ellis has been named manager of the products pipe line division of Sunray Oil Corporation, Tulsa. Ellis formerly was with Great Lakes Pipe Line Company, which he joined in 1934. In 1946 he was made district engineer and built several pipe lines, including the line from Kansas City to Omaha, Neb. He moved to Oklahoma last fall as engineer when the Sunray Corporation products pipe line from Allen to Drumright, and the Great Lakes line from Drumright to West Tulsa were started. These lines were completed May 1.

J. R. Ellis

Victor B. Geibel has been named treasurer of Socony-Vacuum Oil Company, succeeding **John F. Seal,** who has been appointed vice president of the company in charge of finance, a newly-created post.

Cecil C. Johnson, Denver, has joined Tennessee Gas and Transmission Company as budget director. Johnson formerly was with Public Service Company of Colorado. He was also instructor at the University of Denver in management courses.

Donald E. Payne, Standard Oil Company of Indiana, has been appointed assistant general patent attorney. **Vanderveer Voorhees** has been named senior patent attorney. Payne received a chemical engineering degree from the University of Idaho in 1922 and is a registered professional engineer in Illinois. Voorhees received a bachelor's degree in chemical engineering at the University of Illinois, and a master's degree at the same institution.

R. D. Shepherd has been named office manager at Montreal, Canada, for Sun Oil Company, succeeding **G. M. Parker,** who has joined the sales department. **C. W. Lorenz,** office manager at Binghamton, N. Y., has been transferred to Syracuse, N. Y., in the same capacity. **D. W. Carter,** office manager at Allentown, Penn., has replaced Carter, and **W. R. Davies,** office manager at Syracuse, has replaced Davies.

Edwin M. Tharp, vice president and general manager of Ohio Fuel Gas Company for 15 years, resigned May 1 to head a firm bearing his name.

E. R. Love, former Tide Water Associated Oil Company drilling department employe, has joined Camay Drilling Company as general superintendent.

Grayson Ray, landman for the Magnolia Petroleum Company, has been transferred from Crockett, Texas, to McMinnville, Tenn., where the company is establishing a district office.

BOWEN REMOVABLE SWIVEL ROPE SOCKETS

FOR SWABBING AND BAILING

Split Liner Type

These handy rope sockets prevent a fire hazard as they can be babbitted away from a well. They can be removed from the line without cutting the line or melting the babbitt.

The split liner type allows the babbitted line to pass through the Inner Assembly of Bowen Automatic Line Wipers and the solid liner in the other model will pass through the crown blocks.

Both models may be fitted for ½", 9/16" or ⅝" line and are 1⅜" O.D. Connection is 1-1/16" O.D., A.P.I. Sucker Rod Pin.

Split Liner Type, Price $27.50. Solid Liner Type, Price $21.50.
Complete instructions are furnished with each socket. Catalog with detailed information will be furnished promptly when requested.

Through Supply Stores Anywhere in the U.S.A.

Solid Liner Type

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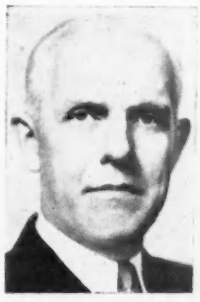
Odessa, Texas, Phone 15—Midland, Texas, Phone 1439

J. Lester Perry, assistant to Benjamin F. Fairless, president of the U. S. Steel Corporation of Delaware, has been elected president of Columbia Steel Company, U. S. Steel's West Coast subsidiary, succeeding the late **William A. Ross** who died in San Francisco April 19. Perry began as a cost clerk and rose to the presidency of Carnegie-Illinois Steel Corporation, U. S. Steel's largest steel-producing subsidiary. He retired from that post July 31, 1946, to become assistant to President Fairless. He was scheduled to retire from the steel corporation May 1, but agreed to serve as president of Columbia until a permanent successor to Ross is elected.



J. Lester Perry

»

J. T. Adams has been named sales engineer in the Heavy Machinery Division for Nordberg Manufacturing Company. He will have headquarters in the new Nordberg district office in the Cotton Exchange Building, Dallas.

»

William L. Bowie, Tulsa, was elected president and treasurer of Hendrick Ranch Royalties, Inc. **Robert A. Duncan,** Clifton, N. J., is vice president; and J. M. Bowie, Tulsa, secretary. Directors include: Duncan, William L. Bowie; W. L. Foster, Tulsa; W. L. Naumer, New York City; and Edwin Tabolowsky, Dallas.

»

Bernard M. Bench, formerly a consulting geologist, and **Robert B. McCulloch,** who was with Stanolind Oil & Gas Company at Craig, Colo., have been added to the staff of the Geophoto Services in Denver.

»

Richard D. Buck, for nine years connected with Schlumberger Oil Well Surveying Corporation in the Gulf Coast region and Oklahoma as chief engineer and district manager, resigned May 1 to open a consulting office in Shawnee, Okla.

»

Henry E. Holden and **Louis Benton** were named original equipment sales engineers for Thermoid Company's Industrial friction material. Holden will operate in Michigan and Ohio with headquarters at Cleveland. Benton will have charge of the Indiana-Illinois-Wisconsin area with headquarters at Chicago.

»

L. W. Rodolf, manager of the Gardner-Denver Company branch office in El Paso for 28 years, has been appointed manager of the San Francisco branch office. **F. R. McNamara** has been appointed manager of the El Paso office. He formerly was a company representative in the Philippine Islands.

Oswald Suter, for the past 11 years with Waltham Watch Company, has joined Technical Oil Tool Corporation, as chief engineer in charge of manufacturing and development. Suter received his horological training in Switzerland, graduating in 1923 from the St. Imier Institute of Technology. Since coming to the U. S. in 1927, he has been with both the Bulova Watch Company and the Waltham Watch Company.

Oswald Suter

W. O. Calvert, who was with Standard Oil Company of Venezuela from 1925 to 1935 and subsequently was employed in equipment sales work, will open offices in London to represent U. S. equipment manufacturers in the Near and Far East. He will devote his time to the promotion of sales for A-1 Bit and Tool Company, Mission Manufacturing Company and Thornhill-Craver Company.

W. O. Calvert

Deaths

Harry McMurray, 41, general manager of oil well supplies for Mid-Continent Supply Company in Houston, died May 4 of a heart attack. He was a native of Mineaola, Texas, and had lived in Houston 25 years. He was employed by Peden Iron and Steel Company for 17 years before joining Mid-Continent in 1936.

»

Joseph H. Bovaird, 77, Bradford, Penn., one of the founders of Bovaird Supply Company and Bovaird & Seyfang Company, died in Baltimore, Md., May 1. At the time of his death he was a vice president and director of Kendall Refining Company of Bradford.

Lee R. Ruble, 47, field representative for Republic Supply Company, died May 3 at Mamou, La. He had been connected with Republic for 12 years.

»

Edward A. Duffy, 60, for the past 15 years depot foreman of Shell Oil Company's Newtown Creek plant, New York, died of a heart attack April 20.

»

Harry C. Deems, 69, Tulsa drilling contractor, died May 1 of a heart ailment. He moved to Tulsa 30 years ago and at the time of his death was an independent producer. He was a native of Parkersburg, W. Va.

OIL TOOL FACTORY FOR SALE

To Settle Estate

Getty Factory in Jennings, Louisiana, on Highway 90 and Southern Pacific Railroad.

Main buildings new in 1938. Shop 18,000 sq. ft. Two-story air-conditioned office building, large record vault, modern furniture and office equipment.

Shop equipped for screen and packer work. This type of business has been continuous since 1907. Also equipped for general machine shop, precision work.

Under court order, minimum price for which plant can be sold is $125,015.62. Terms: Cash when deed is tendered.

Sale may be negotiated with Executrix, Getty Estates, Getty Factory, Jennings, La.

Inquiry may be addressed to G. P. Modlish, Manager of the factory, who will arrange inspection of plant and records on request.

Huge Truck Has 40-Ton Capacity

The driver actually climbs stairs to reach his seat in this truck. Said to be the largest trucking unit in the world, it was manufactured by The Euclid Machinery Company, Cleveland. Giant tires for the vehicle are made by The Goodyear Tire & Rubber Company in Akron. The truck is powered by a 12-cylinder diesel engine of 550 horsepower, has a 40-ton capacity and weighs 80 tons. Trying out the driver's seat for size and height is R. S. Burnham, manager of manufacturers' sales for Goodyear.

E. D. Hall Named President of Weatherford Venezuela Firm

E. D. Hall, drilling and production engineer, has been elected president of Weatherford Spring Company of Venezuela, Inc., and took over his duties at the head office in Caracas May 1. He will be responsible for Weatherford operations in all South American countries. The Venezuelan firm is an associate company of the Weatherford Spring Company of Weatherford, Texas.

E. D. Hall

Associated with Hall in Venezuela is Roland Smith, export representative of the Weatherford Company. J. E. Hall, Sr., owner of the Weatherford Spring Company of Texas, has returned to the U. S. after an extended stay in Venezuela.

Ohio Representative Appointed By Mixing Equipment Company

Mixing Equipment Company, Rochester, N. Y., has announced appointment of a representative to increase field engineering services to customers in Ohio.

The White Industrial Sales & Equipment Company, with offices in Akron and Cleveland will handle Mixing Company's account in Ohio.

In the Akron office, H. H. Baker, Jr., chemical engineer and formerly with Firestone Tire and Rubber Company, will be the customer contact engineer, while O. H. Heinicke and H. H. Baker, Jr., will serve the customers in the Cleveland area.

Trio Buys Into Green Head Bit; Store Managers Are Appointed

Paul Snetcher, president and general manager of Green Head Bit & Supply Company, announced that J. O. Dorroh, M. L. Williamson and Jack De Fee have bought an interest in the firm and will operate the Odessa and Houston, Texas, stores.

Green Head, with headquarters at Oklahoma City, also has a branch store at Goodwell, Okla. Dorroh will operate the Houston branch, Williamson will operate the Odessa branch, and De Fee will be stationed at New Orleans.

Changes in Personnel Announced By Jones & Laughlin Steel Firm

W. J. Creighton has retired from the office of executive vice president of Jones & Laughlin Steel Corporation and will continue in an advisory capacity as consultant to the chairman of the board of directors. He also continues as a director and member of the executive committee.

Frank R. Denton, a newly elected director, has been named a member of the executive committee.

C. L. Austin, heretofore a director and the treasurer, was elected to the additional offices of member of the executive committee and vice president.

H. Parker Sharp, a director and the general counsel, was elected to the additional offices of member of the executive committee and vice president.

V. H. Lawrence, general superintendent of the Otis Works, was elected a vice president. W. R. Elliot, formerly assistant general superintendent of the Otis Works, has succeeded V. H. Lawrence as general superintendent.

W. H. Dupka, controller, was elected to the additional office of vice president. H. W. Graham, director of technology, was elected to the additional office of vice president. W. Randall Compton has been appointed assistant to the president. W. C. Plummer, an attorney of the corporation, was appointed to the additional office of assistant secretary.

Raybestos-Manhattan Occupies New Office Facilities in San Francisco

Raybestos-Manhattan, Inc., has occupied new offices and warehouse facilities at 131 Mission Street, San Francisco 5.

Manhattan Rubber Divisions of Raybestos-Manhattan has announced that Asbestos Company of California, 941 Sixteenth Street, San Francisco, will be its representative in the San Francisco area.

—THERE I WAS...AT 20,000 FEET ...UPSIDE DOWN!!
SAY FELLOWS, THAT REMINDS ME— IF YOU EVER WANT A PACKER TO HOLD DOWN UNDER HI-PRESSURE YOU OUGHT TO TRY THE LANE-WELLS UPSIDE-DOWN PACKER!!
LW
Tomorrow's Tools

SQUEAKS from the BULL WHEEL

Life Is Like This

They bought a 12-room house and set about furnishing it with the premiums from soap wrappers.

Some years later they were showing friends through the place, proudly pointing to each chair and table and lamp and explaining how many soap wrappers were required to obtain the article.

When the tour came to a halt, one of the awed guests spoke up. "But I thought this house had 12 rooms. You've only shown us five. What about the other seven?"

"Oh, you wouldn't care to see them. That's where we keep the soap!"

Or Drown 'Em

"Pa?"

"Yeah, Son?"

"How come Noah didn't swat both flies when he had the chance?"

The Better Way

"Terribly sorry to hear you buried your wife yesterday."

"Had to, old chap. Dead, you know."

Hints for Householders

"I'm giving you the money, Son, but be careful with it. Remember, a fool and his money are soon parted."

"I know, Dad, but I want to thank you for parting with it just the same."

Cooperation, Please

"Now I lay me down to sleep. I pray the Lord my soul to keep and make Fort Worth the capital of Texas."

"Why, darling, why do you put that in your prayers?"

"Because, Mama, that's what I put on my examination paper today."

Leo and the Lady

"You were married in a cage of lions?"

"Yep."

"Exciting?"

"Was then. Wouldn't be now."

Not Guilty

The police car came batting down the road with screaming siren and screeched to a halt beside the small boy.

"Sonny, did you see an airplane come down around here?"

"Nope," said the lad as he pocketed his slingshot. "I've only been shooting at bottles today."

The Woman's Way

"How are you doing in your new job, Jane?"

"Not so good. The boss hasn't complimented me on anything but my work."

Aiming High

He stopped beside a little pond and watched with amusement an old man sitting serenely on the bank with a fishing pole in his hands.

"Whatcha fishin' for, Pop? Whales?"

"Yep."

"You're nuts. Don't you know there aren't any whales in that pond?"

"Sure I know it. But there ain't anything else in it, either. Might as well fish for whales."

Breaking the Ice

Hearing a noise in the kitchen one morning and thinking it was her small son, she called out from the bedroom: "Here I am, darling."

Whereupon a voice boomed out: "This ain't the regular ice man, Ma'am, but here I come."

In the Home Stretch

"What are they playing?" whispered the little man who arrived late at a concert."

"The Fifth Symphony."

"Thank heaven. At least, I've missed four of them."

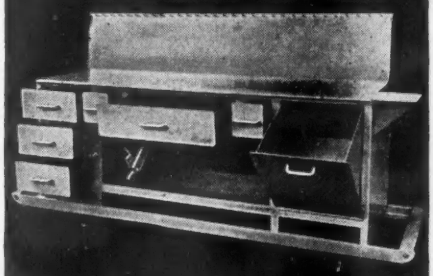
Nice Try, Anyway

An attractive young widow went to Florida on the hunt for a man. After registering at a hotel, she sauntered out on the veranda and seated herself near a handsome young man. Her cough revealed a desire to become acquainted but the handsome chap ignored her. Finally a piece of dainty linen was wafted to the floor almost directly in front of the young man:

Widow (murmuring softly): Oh, I've dropped my handkerchief!

Young man (turning a cold unresponsive eye on her): Madam, my weakness is liquor!

OWEN



Type "A" Work Benches

Keep Tools Where You Need Them—When You Need Them

Yes sir, these benches will really pay off when you're in a bind and need a wrench in a hurry. They keep all hand tools within quick, easy reach and prevent misplacement, damage or loss.

Made of heavy steel plate, they're all-welded for strength and drawers are roller mounted for easy operation. There's plenty of storage space for hand tools, grease guns, rags, etc.

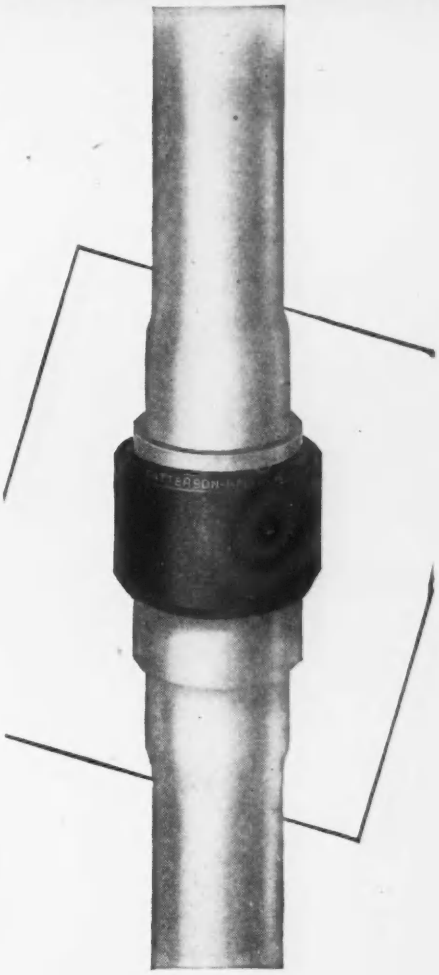
Buy one for each of your rigs . . . they'll save time, tools and tempers.

Sold Through All Supply Stores

OWEN TOOL COMPANY

ROUTE 9 BOX 900-D V-2-0341
HOUSTON, TEXAS

"Best Bet Yet"



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Tubing collars worn by contact with casing steal the profit out of pumping. Patterson-Ballagh Plastic Tubing Protectors prevent both collar and casing wear. Oil-proof, wear-resistant, insulating. They are pressed onto the collar under pressure and will not come off. Made in all sizes. End your tubing troubles. CALL in your Patterson-Ballagh man.

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PLASTIC TUBING PROTECTORS

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6247 Navigation Boulevard, Houston 11
808 Graybar Building, New York 17
931 Russ Bldg., San Francisco 4

BETTER
Steel Forgings for
CHRISTMAS TREE
FITTINGS
BEAUMONT
WELL WORKS COMPANY
BEAUMONT, TEXAS

PAGES 3945 THRU 3964 IN THE COMPOSITE CATALOG

Standco
NO-SMOKE
STANDCO BRAKE LINING
Nothing novel—no bunk, but it gets the job done without scoring brake rims. See pages 3608-3613, Composite Catalog.
Standco Brake Lining Co.
HOUSTON

Have You Checked
The Trading Post?
Turn Back to Page 88

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* The asterisk indicates that detailed information on products and services of the firm will be found in current 15th (1946-47) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

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